Seeds from the Hands of Farmers

Seed Conservation Projects of Brazil's Peasant Farmers

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ABSTRACT

Small-scale family farmers in developing regions traditionally save heirloom or native seeds in order to sustain harvests and conserve well-adapted traditional crop varieties. Seed saving can contribute to lower supply costs, more diversified goods, improved nutrition and farm self-sufficiency. Seed saving by small farmers is also essential in conserving global agricultural biodiversity. However, recent corporate consolidation of seed markets has led to conflictive issues regarding seed types and sources.

In response, native seed conservation projects have been established in several peasant farm communities in Brazil, with support of rural land reform movements and farm extension organizations. One such project is Bionatur Agroecological Seeds, founded in southern Brazil in 1997 by farmers from the Movement of Landless Rural Workers to produce and market agroecological vegetable seeds. This thesis and field research focused on Bionatur as a main case study. Bionatur's history, mission, organization, operations and outcomes are described here, along with analysis of its evident problems and potential. Two other native seed conservation projects with different strategies in other regions of Brazil are presented for comparative purposes. Based on his analysis, the author's recommendations for designing and implementing native seed conservation projects are presented in the concluding chapter.

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Chapter One

Native seed conservation in traditional farming systems

"Agricultural systems are human artifacts, and the determinants of agriculture do not stop at the boundaries of the field".

- Dr. Miguel A. Altieri, University of California, Irvine

Throughout history farmers have selected, saved and reproduced seeds from their harvests to sow in coming seasons. The rich biodiversity of food crops and cultivars that benefit humanity evolved over thousands of years by means of seasonal reproduction and conservation of favored native seed types[1]. Farmers across the world today continue to reproduce and save native seeds in order to breed and adapt crop cultivars to their needs. In the world's developing regions, small-scale farmers carefully select and store supplies of seed to sow and exchange in coming seasons. Utilizing favored seed types and practicing informal crop breeding, small-scale farmers adapt crop varieties over time to diverse ecological zones, soils and climates. Native seeds are used by traditional peasant farmers to diversify production, meet nutritional needs and honor cultural traditions.

As Dr. Miguel Altieri has stated, the conservation crop biodiversity is largely a social process involving communities on a regional scale in the dissemination of crop genetic resources through the circulation of seed lots between farms. In developing countries, informal seed systems often are the norm, in which traditional or peasant

[1] "Native seed" is defined here as a seed line with a history of regional use and adaptation, mainly by traditional or native farmers. This may include heirloom seeds or landraces; c*rioulo* seed is the Portuguese term commonly used in Brazil. "Native seed" does not imply that the cultivar originated in that region.

farmers barter, gift and sell seed lots among family and neighbors, and in local markets. Low-income farmers can gain many advantages by saving and exchanging native seed types. Such benefits include maintaining a sustainable supply of seed from one season to the next, avoiding high costs of commercial seed, increased crop diversity and the adaptation of crops to different micro-ecosystems. Thus, conserving native seed types in informal seed exchange systems is considered an adaptive means of enhancing small-farm self-sufficiency, while diversifying goods for the local market and strengthening food security. On a broader scale such strategies may over time increase crop genetic resiliency and conserve regional agricultural biodiversity (Altieri and Nicholls, 2002; T. Hodkin, et al. 2007).

In Brazil over the past twenty years, some associations of small-scale family farmers and allied organizations in peasant (*campesino*) farm communities have carried out projects that seek to reproduce and conserve traditional, heirloom and native seed types; their work is the focal point of this study.

Thesis statement and key questions

In order to achieve positive outcomes, seed conservation projects in low-income rural communities must be provided with solid technical support, adequate funding and a clear project mission or strategy that meets the needs and wishes of participating farmers. Understanding of local social and economic conditions requires surveys and assessment of the affinity of local farmers for seed conservation activities, and support of farmers' autonomous decision-making processes. Adequate mechanisms for credit and financial

support, technical training and adequate storage infrastructure must also be provided in order to successfully carry out seed conservation activities. Ideally, the guiding mission in such projects is based on involving local farmers in project design and decision-making, and in defining their own goals and needs in terms of seed resources.

I submit that that the native seed projects that I studied in Brazil partially achieved successful outcomes in improving farmers' access to seed resources. However, in my main case study, I identified problems that called for a redesign of project mission and goals in order to broaden farmer participation and improve conditions for conserving regional seed resources.

I studied three native seed conservation projects established in small-farm communities Brazil. My main goal was to learn as much as possible about community-based projects by small-scale, low-income family farmers to conserve native seeds and traditional crops. I set out to determine whether those projects had, or not, improved access to reproducible, diversified seed lots that local farmers could utilize to ensure food security, and as alternative sources of seed to avoid dependency on commercial markets.

Geographic context and nature of the research

I studied three small-scale seed conservation projects of family farmers in Brazil. My main case and field study was focused on Bionatur Agroecological Seeds, a vegetable seed project in Brazil's southernmost state of Rio Grande do Sul (RS). This project took place in communities established in the late 1980s by Brazil's popular land reform

movement, the Movement of Landless Rural Workers[2] , which exists across the country and is widely known and identified here as the M.S.T. I visited Bionatur Seeds in southern Brazil for 3 weeks in February of 2003, where I conducted field research and interviewed participants in the project.

For the purpose of comparative analysis I studied two more native seed projects in Brazil, the SINTRAF Cooperative's maize conservation project in Anchieta, Santa Catarina state, and the community seed banks in the Agreste region of Paraíba state. I was not able to visit the sites those projects due to travel and time restrictions, but I learned about them from interviews with participants and the available literature.

The three seed conservation projects I studied shared goals in common including increasing local capacity to reproduce and exchange native seed lines, and conservation of regionally-adapted crop varieties.

The three projects differed in their strategic approach, in the level of farmer participation, and in their results. I studied each project's trajectory to determine what advantages and benefits local farmers had gained from saving native seed types, and what types of problems might have emerged. The objectives of my research were to identify how specific factors had shaped each project's outcomes, analyze problems and constraints, and identify solutions.

During field research at Bionatur Agroecological Seeds in February 2003 I interviewed project's manager, staff technical extension agents and some farmers. I collected as much information from project participants as the limited time and local social norms allowed. At Bionatur Seeds, it soon became evident that economic and technical difficulties and complex organizational and social dynamics had hindered the

[2] In Portuguese, M.S.T. is called *Movimento dos Trabalhadores Rurais Sem Terra*.

project. Later, I interviewed seed conservation experts in other regions of Brazil, in the cities of Florianopolis, Rio de Janeiro and Brasília.

The following key questions guided my research. What were the mission and principal goals of each project around seed conservation? Who were the participants, and what modes of participation characterized each initiative? To what extent did each project succeed in improving access to genetically-diversified and affordable seed supplies? What problems had impacted the projects? To what extent had these seed projects helped to strengthen local food security and conserve regional agricultural biodiversity? The research led me to seek solutions that might be of use to seed saving projects in small farm communities. My recommendations are presented in the final chapter. It is my hope that my thesis research can contribute, at least in small part, to seed conservation initiatives in similar social and geographic settings.

Research methods and overview

I set out to learn about the establishment and historical trajectory of each seed project, their evolving missions and goals, local environmental and economic conditions, and modes of farmer participation. My approach to the research was based on interviews with project participants during my field studies and on review of the literature.

At Bionatur Seeds I conducted interviews with Bionatur staff, extension agents from non-governmental organizations and farmers. I provided printed questionnaires, but my intended use of those was limited by a lack of predisposition among farmers to participate in formal interviews. I learned a great deal from many group discussions and

informal conversations with local agronomists and farmers. Social dynamics in M.S.T. farm settlements are characterized constant group discussions of community issues; my fluency in Portuguese allowed me to understand relevant issues and to participate in such meetings. I also conducted rapid visual surveys of farms and Bionatur's facilities at local settlements, accompanied by project "technicians", i.e., extension agents. My field research was limited in scope by time constraints and social dynamics. A more complete understanding of native seed conservation projects in Brazil's developing regions will require extensive participatory research by many agricultural scientists, technical experts and farmers in diverse locations over long periods of time.

My analysis was mainly qualitative and informed in part by theory from agroecology and political ecology. In my review of the literature, I read many books and publications, including work on agroecology by Altieri, Nicholls, Rossett and Oldfield, on seeds and plant genetic resources by Kloppenburg, Mooney, and Jarvis et al., on political ecology by Wright, Wolford, Martinez-Allier, Forsyth and many others. I relied on Brazilian researchers for information on two of the seed projects described in chapter four, and about social dynamics in M.S.T. communities.

In Chapter Two I present an overview of the broader issues of seed industry consolidation and seed politics in Brazil, with an overview of the process of monopolization of Brazil's seed industry by transnational corporations. I describe the M.S.T.'s counterpoint role of opposing private sector domination of seed resources and of promoting native seed conservation in peasant communities, and I discuss the movement's political discourse on the right of farmers to have access to seed resources, based on an emerging social principle of food sovereignty.

The principal case study of this thesis is presented in Chapter Three. At the time of my field research, Bionatur Agroecological Seeds operated as a small organic vegetable seed company owned by Cooperal, an M.S.T.-affiliated regional farmers cooperative, and assisted by a set of farm extension agencies. I learned firsthand about Bionatur's founding, history and evolving mission. I collected information on its seed production lines and stocks, storage and processing, farmer participation, and its market-based approach. I examined data on land use, income and farmer participation to determine advantages and disincentives to seed production. I also collected information on production options, organization of labor, the social background of participants and local dietary norms. I took part in group discussions on Bionatur's evident problems, and about the social dynamics and cultural patterns in local communities. Bionatur's staff was forthright in discussions and interviews. However, Bionatur provided limited printed data; few documents on project planning and seed production were made available.

In Chapter Four I examine two native seed saving projects in small-farm communities in other regions; the SINTRAF Small Farm Cooperative's maize seed conservation project in Anchieta, Santa Catarina state, and the AS-PTA community seed banks of the Agreste region in Paraíba state. Both of those projects provided reference points for comparative analysis of Bionatur. I attempted to determine how and why each project evolved differently, and what lessons might be learned from their trajectories. In Chapter Five I present conclusions and suggestions for implementing native seed projects in peasant farm communities.

Researcher's background and inspiration for thesis research

In the past I have studied and researched many aspects of traditional agriculture and rural development in Brazil and Latin America. In the Master in Environmental Study program of the Evergreen State College I studied land use, agricultural systems and political ecology, often with a focus on Brazil. I lived in Brazil in the past and am fluent in Portuguese. In 1990 an undergraduate at Evergreen I carried out independent field research on environmental issues and organizations in Brazil. In the late 1980s I worked in organic produce distribution in Olympia, Washington. I am not a specialist in seed genetics or technologies; my focus is the political ecology of developing regions.

The direct inspiration for the thesis research came from readings and from people I met. In early 2000 California State University historian Dr. Angus Wright spoke at the Evergreen State College about his own field research at M.S.T. communities in southern Brazil. He spoke eloquently about the M.S.T.'s work to introduce alternative farming methods at settlements. In their book "Inherit the Earth", Dr. Wright and co-author Wendy Wolcott briefly discuss the production of organic seeds by M.S.T. farmers in the Bagé region where I carried out my case study (Wright and Wolford, 2003).

In late 2002, Brazilian M.S.T. agronomist and seed project coordinator Ciro Correa visited the Evergreen State College. I helped host Mr. Correa and interpreted for his public presentations in Olympia. Mr. Correa talked about the struggle for livelihood of M.S.T. farmers, and in particular about Bionatur Seed's work to promote organic production of vegetable seeds. As national coordinator for seed production in the M.S.T., Mr. Correa was involved in public outreach and fundraising for Bionatur Seeds. He has

written about the M.S.T.'s efforts to ensure land rights and a sustainable livelihood for peasant farmers and on resisting corporate domination of Brazil's farming systems (Correa, 2002). Mr. Correa extended to me an invitation to visit Bionatur Seeds in Brazil and he helped coordinate my contacts and travel in Brazil. Thus, following preliminary research I went to Brazil in January 2003 to learn more about Bionatur Seeds, meet its participants, and to learn as much as I could about this and other native seed conservation projects by Brazil's peasant farmers.

* * * *

Chapter Two

Seeds: traditional technology, market commodity and political symbol

"Food sovereignty is the basis for forging a free, sovereign society that has the right and the capability to produce its own food".

- João Pedro Stédile, economist and spokesperson for the M.S.T.[3]

The past two decades have witnessed a transformation in Brazil's commercial seed markets, along with the emergence of a new popular political discourse around seed issues. In this chapter I focus on changes in the structure and ownership of Brazil's seed markets, on increasing consolidation of seed markets by transnational agribusiness firms, and on how that process might affect seed options for Brazilian small-scale farmers. Such topics are relevant here because a key goal of the seed projects I studied was to ensure farmers' access to reproducible, well-adapted seeds. This important goal is considered by some to be at risk from corporate monopolization of seed markets.

In Brazil, rural social movements and peasant farmers' coalitions have organized in opposition to corporate control of seed markets. Many small farmers associations and non-governmental organizations in that country work actively to improve low-income farmers' access to seed resources and to conserve traditional crop diversity. Their political activities include building international activist coalitions around seed issues,

[3] Quoted in an interview in the newspaper La Jornada, México, August 27, 2003.

carrying out protests and direct actions against transnational seed companies, and organizing conferences and public festivals to celebrate native seed diversity.

The M.S.T. and the global peasant farmers' organization Vía Campesina are central players in the politics of seed resources. These organizations have evolved a determined political discourse that advocates for peasant farmers' rights to have full access to affordable, well-adapted seed supplies. This goal is expressed in the principle of food sovereignty, or farmers' rights of access to land and the means of production, including control of reproducible seed supplies (Vía Campesina, 2003).

Corporate consolidation of seed markets, globally and in Brazil

As modern industrialized farming extends over the global agricultural landscape, the seed industry has become both more technically specialized and controlled by ownership of large corporate firms. In modern agriculture, seeds have become a key trade commodity largely supplied and owned by a few international agribusiness corporations. Laboratory-improved seed lines are constantly being developed by professional plant breeders at biotechnology firms; such seeds are often genetically uniform, high-yielding varieties (HYV), and sometimes genetically modified in plant breeding laboratories. Commercial seed types are often designed for use in large-scale mechanized farming, sometimes to be used in "packages" along with complimentary agrichemical herbicides and fertilizers (Mooney, 2003; Kloppenburg, 1988a).

The control of seeds and plant genetic resources by powerful commercial interests has historical roots in the 17th and 18th centuries. As European colonial powers

established plantations in the Americas, plant materials and seed germplasm of Old World crops such as sugarcane, indigo and coffee were transferred to the new colonies. Later, British trading companies took rubber, coffee, tobacco, sisal, and other cultivars from the Americas to grow in England's colonies in India and Southeast Asia. Plant genetic transfers at times involved contraband of germplasm, as in the case of the rubber tree (*Hevea brasiliensis*) whose seeds were smuggled from Brazil by British agents in 1877, eventually leading to establishment of vast rubber plantations in southern Asia (Brockway, 1988).

Contraband of seed resources occurred more recently in Brazil. From 1999 to 2004 transgenic (genetically-modified) soybean seeds were made illegal for use in farming by decree of the Federal government, yet such seeds were smuggled extensively from Argentina into southern Brazil, where farmers could buy them at below-market prices. By 2004 pressure from agribusiness interests led to legalization of transgenic soybeans in Brazil and to subsequent rapid expansion of industrial-scale soybean production across the country, with serious environmental impacts, including deforestation of large areas of the eastern Amazon rainforest.

Brazil has experienced the rapid growth of large-scale industrialized farming over the past half century. The expansion of mechanized chemical-based farming was accompanied by consolidation of the country's seed industry by large international agribusiness and biotechnology corporations, often by means of buyouts of smaller national seed companies (Wilkinson and Castelli, 2000).

Some laboratory-improved seed lines sold by biotechnology corporations, including Monsanto's RoundupReady© soybeans, are genetically modified to resist

heavy applications of herbicides. Although such technologies may be well suited to farming in large-scale monocultures, they are not necessarily well-suited to the needs and farming practices of small farmers. Agrichemicals involved in industrialized farming can be costly and may pollute local water supplies and soils. Some commercial seed lines may not be well adapted to regional soil and climate conditions, nor suited to the market economy of peasant farm communities.

Smallholder family farmers require reproducible seeds that are well adapted to local farming practices, local food needs and market conditions**.** High costs of commercial seed can be a problem for small farmers. While capitalized large and medium-scale farms can readily absorb cost of commercial seed, family farmers with low net incomes may find commercial seed lines to be prohibitively expensive. Thus, small farmers who are not able to reproduce and save seed lots on the farm may suffer financially from dependency on the purchase of commercial seed.

Improved commercial seeds types are often considered genetically less diverse and less easily reproducible on the farm than native and traditional seed types. Hybrid and bioengineered seed lines are often not reproducible and require seasonal purchase. Some new seed biotechnologies are patented subject to strict contractual terms for use. Some seed experts point to risks from loss of crop biodiversity as a consequence of corporate consolidation of seed markets.

According to University of Wisconsin sociologist and author Jack R. Kloppenburg, Jr. transfers of commercial seed biotechnologies and free-market commodification of seed resources during the later part of the 20th century have accelerated the transformation of agricultural systems. He views the commercialization

of hybridized seed types and the legalization of plant breeders' rights for private corporations as processes that lead to increased monopolization of seed markets by large transnational biotechnology corporations, including Monsanto, Cargill, Syngenta, BASF and others (Kloppenburg, 1988a). Kloppenburg puts forth that development of hybridized and genetically engineered crop varieties can result in what he calls, "radical changes in the political economy of plant breeding and seed production". He refers to seed hybridization as a transformation of seed from a "use-value to an exchange-value", and views seed commodification, or the transformation of seeds into a trade commodity, as a process that has facilitated monopolization of seed and farm supply markets in hands of corporate agribusiness (Kloppenburg, 1988 a: 93).

Kloppenburg has written extensively on the commercial seed industry's impact on agricultural biodiversity and has examined the global seed market transformation from a Marxist perspective. He deplores the end of the historic value of seeds and plant germplasm as public goods, i.e., "common-heritage" resources, and he criticizes the transformation of seed into a laboratory-modified commercialized commodity. Kloppenburg points to the economic inequity caused by the separation of farmers from reproduction of seeds in their fields, and from, "substantial, even extreme, dependence on 'imported' genetic materials" (Kloppenburg, 1988 a: 169).

Indeed, over the past two decades the structure and ownership of the global seed industry have been transformed as biotechnology corporations have gained consolidated ownership of vast sectors of the global seed industry. In Brazil, a few transnational agribusiness firms, including Monsanto, Cargill and Dow, have expanded their range of operations in multiple corporate mergers and through buyouts of smaller seed companies.

According to a study by Wilkinson and Castelli, Brazil's commercial seed markets have differentiated and segmented sectors. Each sector has been impacted by new seed technologies and by the increased scale of farming. They suggest these changes are, "intensely interlinked with modernization…concentration, specialization, and regionalization of production" (Wilkinson and Castelli, 2000: 29).

Wilkinson and Castelli characterize Brazil's commercial seed markets as comprising three principal sectors: A) hybrid seeds, mainly maize, sorghum, sunflower, and soybean varieties; B) varietal seeds, such as open-pollinated wheat, soybeans, rice, and cotton; and, C) horticultural or green vegetable seeds.

Brazil's hybrid seed market is seen as highly consolidated by Wilson and Castelli. Development of maize hybrids in Brazil was carried out initially by the Brazilian seed company Agroceres from its founding in 1945 until the company was purchased by Monsanto in 1998. Wilkinson and Castelli point out that in Brazil by 1999 four large transnational corporations conducted 90% of total commercial hybrid seed sales: Monsanto, with 60% of total sales, followed by Pioneer with 14%, Novartis with 11%, Dow with 5%, and the only Brazilian-owned company, Unimilho, with 5% of sales (Wilkinson and Castelli, 2000).

The varietal seed sector is the market for open-pollinated varieties; mainly wheat, soybeans, rice, and cotton. This sector of the market is more diversified in Brazil than is the hybrid sector, with a stronger presence of regional cooperatives and companies, as well as public plant breeders such as the private-Federal agricultural research agency EMBRAPA[4]. According to Wilkinson and Castelli, in the 1996-97 season 40% of total farmland planted in Brazil was sowed in seeds developed by EMBRAPA plant breeders.

[4] EMBRAPA: Empresa Brasileira de Pesquisa em Agricultura.

Disease-resistant EMBRAPA soybean has contributed to the rapid expansion of soybean production across Brazil. Transnational seed corporations are now making inroads into the varietal seed market (Wilkinson and Castelli, 2000).

The smallest and most diversely segmented sector of the seed market in Brazil is for horticultural vegetables. Thirty percent of green-vegetable seed production is directed to large-scale mechanized horticulture; two corporations, the Mexican firm Seminis and Japanese-owned Agroflora dominate 60% of this sub-segment. A second "semi-professional" sub-segment produces 45% of green vegetable seed, mostly by three private companies: Horticeres (owned by Seminis), Isla, and Top-Seeds. Third and smallest sub-sector is the "envelope segment", comprised of small-scale vegetable seed producers who sell and barter seeds regionally and locally, and who produce a quarter of horticultural seeds in Brazil (Wilkinson and Castelli, 2000). Bionatur Seeds, the main case study here, was in 2003 a small for-profit vegetable seed producer within the envelope segment.

Economic and environmental risks of seed market changes

Not every smallholder farmer can easily select and save adequate supplies of seed from each harvest. The capability and choice of each farmer to save seed depends on many factors, including the availability of labor, storage, technical training and skill in seed conservation, food needs, farm income and market conditions.

As many native and regional seed lines disappear across the world, and as sales of modern "improved" seed lines increase exponentially, more low-income farmers may face difficult choices about the type and source of the seeds they utilize. As mentioned,

some seed experts posit that new seed technologies pose grave economic risks to small farmers. The nature of such risks is complex. Farmers can become dependent on expensive improved seed lines that are marketed along with complimentary agrichemical "packages". To reduce labor, small farmers who in the past reproduced and saved seed from each harvest may cease doing so if non-reproducible commercial seed lines become more easily available on the market. Some commercial seed lines may be unsuitable for traditional farming practices, or not well adapted to extant soil conditions and climate stress. Some commercial cultivars may not meet local dietary needs or market demand. Low-income family farm sectors may have limited technical capability to reproduce and store seed lots, and thus can face risks in maintaining seed supplies (Correa, 2003; Stédile, 2003; Wilkinson and Castelli, 2000).

Much has been written about the problem of genetic erosion of agricultural crop diversity. From research in Perú comes evidence of the genetic erosion of traditional potato varieties that have fallen out of use in some localities. Seed experts Cary Fowler and Pat Roy Mooney cite Dr. Carlos Ochoa of the International Center for the Potato who in the 1980s found that 45 traditional potato varieties formerly cultivated in two areas of northern Peru had disappeared from local farms following the introduction of a single "improved" commercial variety (Fowler and Mooney, 1990).

Fowler and Mooney have called hybrid seed varieties, "the major force causing the loss of our agricultural heritage". They cite the case of Brussels sprouts production in Great Britain, where a study by Innes showed that 24 older or heirloom varieties had disappeared from catalogues between 1965 and 1974 following introduction of hybrid varieties (Fowler and Mooney, 1990, citing N.L. Innes, 1975: 74). In developing

regions, hybridized commercial soybean, maize, and rice seed have come to dominate large segments of the market (Kloppenburg, 1988a; Wilkinson and Castelli, 2000).

Genetic contamination of conventional and traditional cultivars by transgenic crops through cross-pollination is another environmental problem. A well-known example is the contamination of traditional *teosintle* maize varieties by transgenic maize genes in Oaxaca and other regions of México (Altieri and Nicholls, 2003; Quist and Chapela, 2001).

An emerging politics around seed issues

Across the world, conflicts and acts of social resistance have resulted from popular opposition to seed market monopolization by agribusiness and introduction of genetically modified seeds. Political strife has resulted around seed issues on a global scale. Peasant farmers' movements in Brazil, India and Mexico have carried out direct actions and land occupations to protest agribusiness monopolization of seed resources and transgenic seeds. In Brazil, activists groups opposed to transgenics have destroyed experimental plots of such crops on several occasions. In their view, both transgenics and corporate consolidation of commercial seed markets lead to losses of native crop biodiversity and economic risks for struggling family farmers.

Thus, in the developing regions over the past decade, agricultural seed itself has become a powerful political symbol for rural social movements. As activist organizations advocate for peasant farmers' right to control seed resources, they also promote native seed conservation initiatives and seed exchange networks.

Brazil's peasant farmers' land reform movement, the Movement of Landless Rural Workers (M.S.T.) plays a prominent role in seed issues. The M.S.T.'s national policy guidelines call for peasant farmers to control self-reproducible native seed resources as a technical and economic imperative, and as an inalienable social right. These goals are clearly expressed in their motto, "Seeds in the hands of farmers".

Bionatur Agroecological Seeds to some extent represents a model project for the ideal of food sovereignty and access to seed resources (Correa, 2003). However, it is open to question whether the project by 2003 had met goals expressed in the M.S.T and Vía Campesina's declarations on food sovereignty. The following section describes an event on seed issues that I attended in 2003 that helps illustrate the social and political importance of seed issues in Brazil.

"Seeds: Heritage of Humanity": Seed Politics at the 2003 World Social Forum

In January 2003 I attended the World Social Forum[5] in Porto Alegre, Brazil, where a new international campaign on seed issues was being inaugurated. A large public event called "Seeds: Heritage of Humanity"[6] took place on January 24th, co-sponsored by the peasant farmers movements Vía Campesina, the M.S.T., and other organizations. An estimated ten thousand people attended the event; the crowd nearly

[5] The World Social Forum is a yearly week-long international mega-conference of international activists, political organizers, and non-governmental organizations (NGOs) that work on many fronts, including agriculture reform and peasant farmers rights; the first one took place in 2001.

[6] In Portuguese: "Sementes: Patrimonio da Humanidade".

filled a large indoor stadium. Farmers, activists and seed experts from several countries were in attendance, along with the general public.

At the event a panel of seed experts spoke about peasant farmers' needs and rights, and about seed politics and seed market transformation. The panel of speakers included Dr. Pat Roy Mooney, a Canadian researcher and writer on seed biotechnologies, U.S. agronomist Dr. Peter Rossett (formerly with Food First), Ms. Francisca Rodriguez who represented the Chilean native seed conservation organization Anamuri, and Dr. João Pedro Stédile, an economist and principal spokesperson for the M.S.T.

During the presentation, the speakers highlighted their concerns about seed genetic modification, increased dominance of global seed markets by transnational agribusiness, problems related to seed patents and plant ownership rights, the needs and struggles of peasant family farmers and the erosion of agricultural biodiversity, including the loss of many open-pollinated native seed lines. Dr. Mooney spoke about ecological risks of genetically-modified seed types, such as non-reproducible Terminator ® [7] seed lines developed by Monsanto. Dr. Rossett spoke about the deep cultural and ecological significance of native seeds for indigenous communities and about new seed conservation initiatives taking place worldwide. He characterized peasant family farmers as traditional stewards of the world's agricultural genetic heritage (Seed Heritage event, 2003).

Ms. Francisca Rodriguez of the Chilean organization Anamuri portrayed seeds as the rich cultural heritage of peasant societies; as "a gift of collective societies, not to be monopolized, appropriated, or privatized". Ms. Rodriguez also stressed the political significance of popular struggles for food sovereignty, a political framing around the concept of food security (Seeds Heritage event 2003; Rodriguez, 2003).

[7] Terminator seeds are genetically designed to become sterile and non-reproducible prior to harvest.

The final speaker was Dr. Stédile who made a trenchant speech calling for peasant farmers and social movements to unite and work toward, "land, social justice and economic reform for the emancipation of millions of Brazil's small farmers". He proclaimed the founding of an international coalition of peasant farmers to, "build a new model of sustainable agriculture, and a society of justice and solidarity", to ensure "access to land and biodiversity", and to help to secure farmers' access to "seeds, health, and education". He called for organized opposition to transgenic (genetically-modified) seed lines, for the cancellation of corporate seed patents and seed ownership rights, and for an end to control of seed markets by transnational firms. Dr. Stédile summed up his rousing speech with the phrase, "seeds in the hands of farmers"[8]. The proposed strategy was to ensure small farmers' control over native seed resources by establishing projects to reproduce and conserve native seeds (Seeds Heritage event, WSF 2003; Stédile, 2003).

Each panelist offered concrete proposals, including forming community-managed seed banks and regional seed exchange networks, strengthening education and technical assistance in peasant communities, and promoting the cultural and nutritional value of native seeds and regional crops to the general public. In sum, Dr. Stédile and the other speakers articulated a political position that linked peasant farmers' social rights and livelihood to control over reproducible seed supplies (Seed Heritage event, 2003).

The Seeds: Heritage of Humanity event lasted for 90 minutes and the audience appeared engaged throughout. The event climaxed with a multimedia performance of music and poetry, waving flags and declarations exalting the value of seeds and land. Many in the audience were visibly moved. As the crowd left the stadium volunteers distributed packets of vegetable seeds to each spectator. I later learned that up to 10,000

[8] I have slightly modified this slogan as the title of my thesis.

seed packets, with most labeled “Bionatur Agroecological Seeds”, were distributed to the public at the event (CETAP, 2003).

Following the Seeds Heritage event I joined thousands of people in a march to another stadium where Brazil’s newly-elected President Ignacio Lula da Silva was scheduled to address the public. The mood was joyous as marchers sang M.S.T. anthems until we reached the stadium. However, President da Silva had already left; many expressed their disappointment. Even so, the Seeds Heritage event seemed an auspicious beginning to my field research.

The Seeds Heritage event was significant in my research because it showed that control over seed resources had become a pressing political issue for Brazil’s peasant farmers and rural social movements. Political debates and conflicts over seed access and food sovereignty had become widespread in Brazil.

M.S.T. literature on the “Seeds: Heritage of Humanity” event describes it as a campaign to “reaffirm and struggle for the historic right of people to access and cultivate the biodiversity of the planet”. M.S.T. seed coordinator Ciro Correa has written that the seed campaign is directed toward, “the rescue of peasants’ autonomy to produce their own seeds”, and “as a fundamental instrument for construction of a new model of agriculture based on agroecology, the reconstruction of the (agricultural) landscape, the promotion of food security and sovereignty, and the restoration of the productive capacity of soils (Correa, 2005)”.

The global peasant farmers’ movement Vía Campesina defines food sovereignty as, “the right of all people to produce their own food and to shape the conditions necessary for sustaining their own food production”, and, “to define their own

agricultural and food policy, without dumping (of farm goods and supplies) from outside countries." These ethical values prioritize, "access to land, water, and credit" and "free access to seed" (Vía Campesina, 2003).

During that week in Porto Alegre, I met with Bionatur managers and interpreted languages in meetings between Bionatur representatives and potential donors from international foundations. I visited M.S.T. settlements in the Porto Alegre area. At the time I was formulating important questions about whether the new political discourse on seeds and food sovereignty was translating into practical results in M.S.T. settlements.

Following my time in Porto Alegre I traveled with a lively group of M.S.T. farmers about 180 km south to the town of Candiota, where I was based for three weeks of field research, hosted by Bionatur staff members. I carried out interviews and learned a great deal about Bionatur and its activities. I participated in many group discussions with extension agents and farmers, collected information, and observed conditions on local farms in the study area.

At the time, Bionatur Seeds appeared to be the M.S.T.'s main seed saving project in Brazil. As such, it represented a pilot project in M.S.T. communities for the ideals and proposals brought forth at the Seeds: Heritage of Humanity event. However, I soon learned that a series of setbacks had adversely impacted Bionatur. In initial interviews, coordinator Correa and operations manager P revealed that serious problems had hindered the project. Two consecutive seasons of high rainfall had damaged seed crops and resulted in spoilage of seed stocks. The project suffered from limited farmer participation and lack of financial credit and infrastructure. Bionatur's coordinators were

frank in admitting that the project was practically at a standstill; they were actively searching for funding and technical assistance.

This sobering perspective brought out key questions in my research. What constraints had emerged at Bionatur, what were the causes, and what solutions might be found? Why was farmer participation limited? Could the Bionatur project meet the ambitious social and political goals articulated at the Seeds: Heritage event? The project coordinators cited possible causes for the problems at Bionatur. They stressed the need for participative diagnostic surveys. During my field research some of the technical constraints and social dynamics underlying Bionatur's problems became more evident. The main case study of Bionatur Agroecological Seeds is presented in Chapter Three.

* * * *

Chapter Three

Case study: Bionatur Agroecological Seeds in Rio Grande do Sul, Brazil

The main case study in my thesis research was focused on the work of Bionatur Agroecological Seeds[9], a vegetable seed project in the southern Brazilian state of Rio Grande do Sul. Bionatur Seeds was founded in 1998 by the regional farm cooperative Cooperal, affiliated to the Movement of Landless Rural Workers (M.S.T.). Most of Cooperal's 900 member-farmers settled in the region in the early 1990s by means of land reform initiatives guided by the M.S.T. In this chapter, I present a history of this seed project based on what I learned in early 2003 during my field research in the region.

I begin with an overview of the geography and history of farming in the region, including the area's climate, soil types, migration patterns and social origins of the rural communities. This should help to illustrate how environmental factors and social variables helped shape the region's agriculture.

Later in the chapter I examine Bionatur's goals and strategies, and the roles of founders, agents and farmers, based on interviews and discussions held with staff and collected documents. I looked at the project's seed lines, yields, processing and storage facilities, number of seed producers over time, extent of distribution and market access, and the roles of extension agents. I took part in participative discussions with Bionatur

[9] In Portuguese, *Sementes Agroecologicas Bionatur*.

founders, coordinators, extension agents and farmers during which we discussed Bionatur's evolving mission and organizational structure, patterns of farmer participation, evident problems and more.

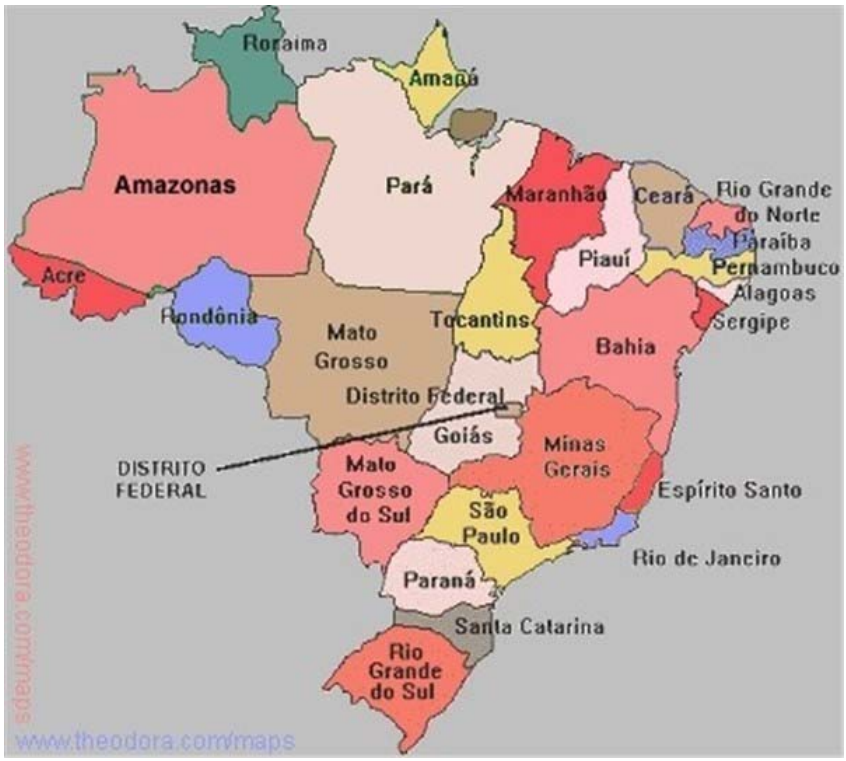
My main goals in the case study were to determine what benefits and resources Bionatur Seeds had provided to local farmers in its 6-year trajectory, what had been accomplished, what problems had emerged, and what potential might exist for successful outcomes and expansion of the project. My analysis of Bionatur's outcomes is presented both in this and in the concluding chapter.

The Campanha region: geographic setting and climate of the research region

The *Campanha* region is a low-lying plateau of prairie grassland and farmland located in southernmost Rio Grande do Sul state (RS), adjacent to Brazil's border with Uruguay. The plateau ascends gently eastward toward a small range that separates it from lowland plains along Rio Grande do Sul's Atlantic coast; to the west the Campanha descends toward the Alto Uruguay River. The plateau averages roughly 200 meters above sea level in the study area; it is the headwaters of four rivers, the Ibicuí, Negro, Camaguá and Jaguarão. The study area is located at approximately 31' latitude S, 54' longitude W (IBGE, 2005; *see Map A and Map B on the following page*).

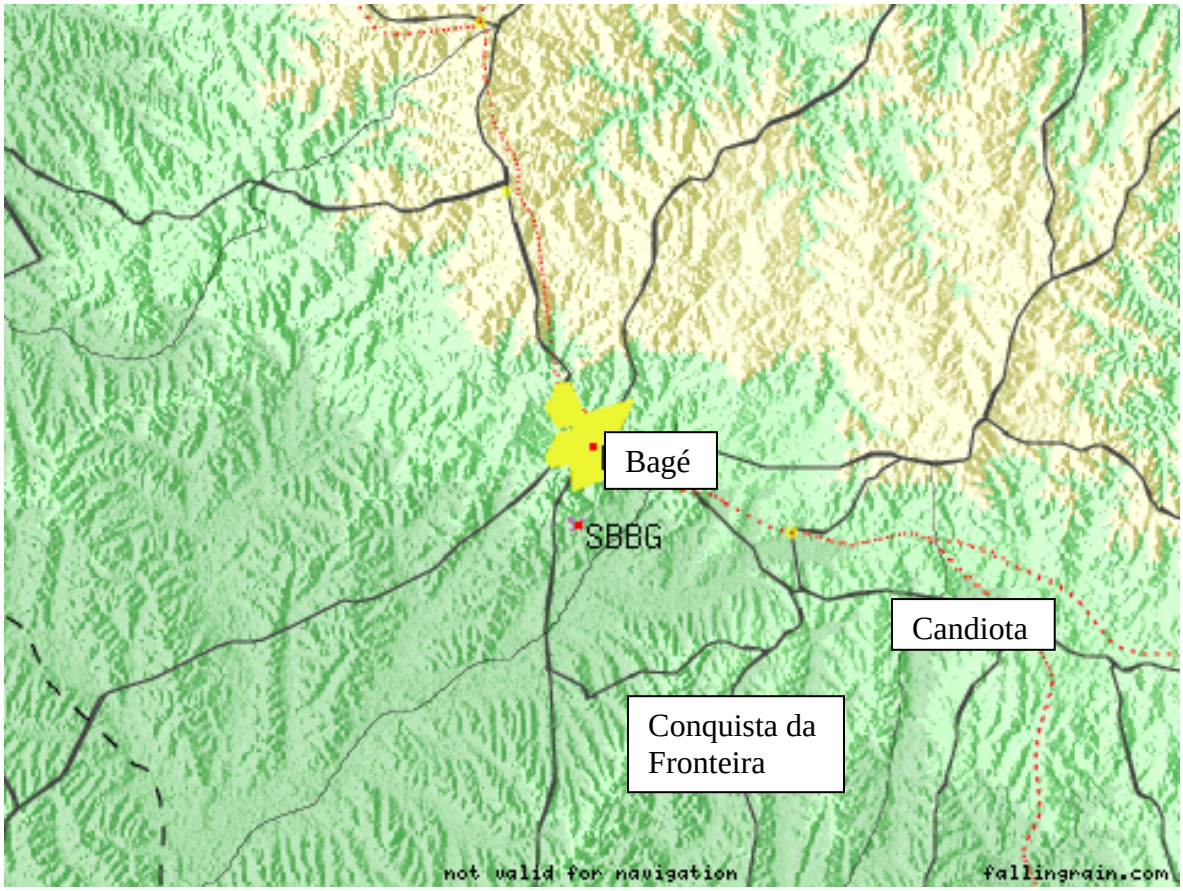
The Campanha plateau's rolling rangeland is interrupted by occasional hilly areas and sparse patches of secondary and scrub forest. Eroded ravines slice many hillsides; small bogs and wetlands are found in low-lying zones.

<u>Map A</u>: Brazil, by States



<u>Map B</u> - The State of Rio Grande do Sul, Brazil (The Campanha region is circled).

<u>Map C</u> - The City of Bagé and the Campanha Plateau Region
Topographic relief with higher elevations in lighter colors; roads in grey, railroad lines in dotted red



Cattle ranches and vast crop monocultures of soybeans cover much of the land in lower altitudes of the Campanha, interspersed with medium and small farms. The region's small towns and settlements are linked by clay-surface roads and a few paved highways. A railroad line runs to the coast and beyond. The city of Bagé (estimated population of 120,000) is the region's commercial hub, about 35 km northwest of the study area settlements (*see Map C*).

The Campanha is located in Brazil's temperate climatic zone. The humid temperate climate shows more seasonal temperature variation than in subtropical zones of northern Rio Grande do Sul. Rio Grande do Sul's climate is classified in the Koppen system as type Cfa, or "wet with mild winters, hot summers, and no dry season",

although dry spells do occur (Bell, 1998:13). Average annual temperature in the region is 17 ^{o} C., with a monthly temperature average of 12.2 ^{o} C in July the coldest month, and 24.2 ^{o} C in February, the hottest. Frosts can occur from April to October, with the most severe in July and August (EMATER, 2003; Moreira, 2003). Rainfall in the Campanha region averages 1,350 millimeters per year, with more rainfall in the warm season from December to March than the drier cooler season from May to July.

From 2002 to 2005 the Campanha region suffered abrupt changes in precipitation, in which two years of extremely high rainfall were followed by two years of severe drought. In 2002 total annual rainfall at the town of Hulha Negra was measured at 2,921 mm, or 1,490 mm above the normal average (Moreira, 2003; see table 3B).

<u>TABLE 3A</u> Monthly precipitation, 2002, millimeters per month.
Hulha Negra municipality, Rio Grande do Sul, Brazil
(Source: EMATER Regional Office, Hulha Negra, cited in Moreira, 2003)

2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**total**
mm	191	148	269	357	110	184	196	313	248	283	264	358	**2,921**

During 2002 and 2003 long periods of heavy rainfall caused widespread flooding and soil saturation that severely impacted farming in the region. In February 2003, I observed heavy rains and flooded zones in low areas, which impeded transportation for days on clay surface roads. In 2002, high rainfall and humidity led to crop losses and spoilage of seed supplies. At Bionatur, seed production and storage were adversely impacted by the persistent rains. Coordinators and farmers reported that much of the company's seed stock in storage was lost. Saturation of clay-based soils impeded sowing

of new seed crops (Correa, 2003; Rockett, 2003).

Two years later in 2005 a severe drought impacted harvests across Brazil's three southern states, posing a different set of challenges for the region's farmers. In March of 2005 average monthly rainfall fell to between 40 and 80 mm in parts of Rio Grande do Sul. The drought resulted in crop losses across southern Brazil, in particular of soybean and maize harvests. Loss of up to 80% of the 2005 soybean crop was recorded in Rio Grande do Sul. With a 61% drop in average soybean yields per hectare across southern Brazil, lost revenues for the state's soybean farmers was estimated at R$ 600,000,000[10]. Maize yields across Rio Grande do Sul dropped by 65% in 2005 (Appasul, 2005; Osava, 2005). It is not known to what extent the drought affected Bionatur's operations in 2005.

The choice of seed types may have been an aggravating factor causing severe impacts on crops in southern Brazil during the 2005 drought. Reports from the state seed producers association and the press highlighted the need for well-adapted seed to withstand climate stress. Commercial seed lines in widespread use were reported to be inadequately adapted to drought conditions. In 2004 an estimated 70% of Rio Grande do Sul's soybean crop was planted in contraband transgenic seed. According to Narciso Barison, president of APASSUL, Rio Grande do Sul's statewide seed producers' association, "transgenic seeds are smuggled into Brazil from Argentina and are not adapted to the local climate, so they proved less resistant to the water shortage" (APPASUL report, 2005).

As the 2005 drought set in farmers who wished to return to using well-adapted regional varietal soybean seeds found that commercial stocks had been exhausted.

[10] The exchange rate was approximately R$ 3 to US$ 1 in early 2003.

Smaller seed companies producing varietal soybean seeds had been edged out of the market by contraband transgenic seed, which sold at below market price. It may be inferred from those reports that during the 2005 drought lack well-adapted soybean seed supplies may have exacerbated crop loss in the region (Appasul, 2005; Osava, 2005).

Crop failure due to climate extremes highlights the importance of maintaining high levels of crop diversity and seed types that are well adapted to resist climate stress. Improved access to native seed varieties may have helped mitigate crop loss during the 2005 season. This situation points to problems in the capacity of commercial seed companies in Brazil to meet demand for regionally well-adapted seed types.

Establishment of MST settlements in the study area

From 1988 to 1997 many landless peasant families affiliated with the M.S.T. migrated to the Campanha region to establish new homesteads and small farms on land obtained through Brazil's constitutionally mandated land reform process[11]. The largest MST settlement in the study area is Conquista da Fronteira, where the Cooperal Regional Cooperative and Bionatur's seed storage and processing facilities are located. Bionatur's administrative office is in the small town of Candiota, about 23 kilometers from Conquista da Fronteira. In 2003 most of Bionatur's management, staff and extension agents lived in Candiota; farms of Bionatur seed producers were dispersed among the area's settlements (see Map C).

Land reform settlements in the Conquista da Fronteira area consist of about 1,200

[11] The Campanha region is estimated to have about 40% of total MST settlements in RS state (Navarro, Moraes, and Menezes, 1997).

small family farms, with an estimated population of 8,000 people. Total area of local M.S.T.-founded settlements was estimated at 18,000 hectares, but according to Bionatur Manager P, a well-defined land demarcation and a complete census of local settlements had not taken place as of 2003 (Manager P, 2003).

The Cooperal Regional Farmer Cooperative is the principal farmers' organization at Conquista da Fronteira; most farmers who work with Bionatur Seeds are members. Bionatur's seed processing facilities and two storage warehouses were located at the center of the settlement, along with Cooperal's offices, a small grocery store and an abandoned school building. This crossroads did not have a public square, commonplace in most Brazilian small towns; farms at the settlement were widely dispersed.

Conquista da Fronteira is connected by rough clay-surface roads to the nearby towns of Hulha Negra (population 4,300; 18 kilometers N) and Candiota (pop. 1,000; 23 km. NE) and to the city of Bagé, about 35 km. NW. The settlement is laid out in a broad low-density pattern; most homesteads here are set apart from each other. This is in contrast with other M.S.T. settlements I observed in other areas in which compact *agrovilas* of closely clustered homes are the settlement pattern.

According to Bionatur staff there was little published data available on conditions in local area settlements, in part due to lack of capacity to carry out in-depth surveys and gather data. A relatively high rate of migration between local settlements and other areas also made it difficult to track local conditions (Manager P, 2003).

Bionatur staff estimated the average size of local family farms at around 23 hectares. M.S.T. settlements in the study area were established on areas of higher ground. On some farms arable land is limited by abrupt ravines and eroded slopes. The

flat low plateau surrounding the settlement is occupied by large-scale private farms and cattle ranches, with evidently richer soils.

Soils types in the study area are characterized as clay with a thin topsoil layer, taxonomically classified as *vertisols*. Brady describes vertisols as, "soils with high content of swelling clay; deep wide cracks develop in dry periods (Brady, 1984)". Local soil is reddish-orange in color with a dense clay texture, shallow horizon and somewhat poor drainage characteristics.

According to interviewed agronomist Moreira and farmer Rockett, soil types in the settlement are fertile enough to farm, but difficult in texture for tillage. Rockett and Moreira described local topsoil as relatively high in organic matter (up to 4.5%), with slightly acidic pH and a high level of base saturation (CTC). Such characteristics allow for two to three seasons of farming with minimal fertilization, after which soil fertility rapidly declines (Moreira, 2003; Rockett, 2003).

Local extension agents and farmers agreed that the main environmental constraint to farming in the area was the difficulty of tillage on waterlogged soils during rainy seasons. Agronomist Moreira assessed local soils as problematic, due to poor drainage and saturation in the wet season and excessive hardening in dry weather. Moreira also noted problems of soil compaction due to use of tractors and harvesters on a few farms in the settlement that utilized heavier machinery. Use of large tillers or harvesters appeared limited to a few farmers who could afford high rental fees for farm equipment (Moreira, 2003; Rockett, 2003).

I observed farm production that varied between farms in the study area. Common local crops and livestock included forage grasses, beans, feed corn, dryland rice,

sorghum, melons, tree fruits, dairy, some cattle and pork. While many farms were evidently active, numerous parcels lied fallow and much of the landscape showed no evidence of recent farming activity. The total land area involved in farm production at the time in the Conquista settlement was not determined.

Water supply was plentiful across the region during the exceptionally wet season of early 2003. Many settlement homesteads had artesian wells. Small ponds, springs, and a few small irrigation canals were observed in the settlement area. Large-scale mechanized irrigation systems were not seen. On some farms small-scale irrigation systems fed from duck ponds were used on one to two-hectare fields.

Parts of the study area suffer environmental impacts from a local open-pit coal mining operation. Coal extracted there supplies a coal-fired power plant located near the town of Candiota. At the quarry location, extensive erosion was observed and creeks flowing downhill to some farms were visibly contaminated with oily effluents. Local extension workers were uncertain about the impacts of mine contaminants on the local watershed and farmland. One farmer complained of respiratory problems, which he blamed on emissions from the power plant's smokestacks (Agent M, 2003; Farmer J, 2003). Although the impacts of the coal quarry and power plant on crops and livestock had not been studied, it was evident that water from streams near the quarry would be questionable for use in crop irrigation.

Most farmhouses at Conquista da Fronteira are simple two or three-room wood-frame houses with tin roofs. Some homes appeared to be built precariously; only a few were of a stronger brick or frame construction. Many, if not most, homesteads have access to electricity and basic appliances. Most farmhouses stand in open fields far from

neighbors and exposed to wind; a few were surrounded by shade and fruit trees. Windbreaks of non-native eucalyptus and acacia species bordered some pastures and cultivated fields. Most farms had simple livestock pens, small rustic barns and sheds. With few exceptions, home vegetable gardens were rarely observed at homesteads. In sum, from my observations and discussions, family farms at the settlement of Conquista da Fronteira showed uneven patterns of activity and reflected a fairly low farm income.

Another local settlement called Coptil was founded by M.S.T. farmers in 1990, located 8 kilometers from Conquista da Fronteira. It has remained small, with approximately 40 families. At Coptil homes are laid out in a compact clustered village circled by groves of eucalyptus and fruit trees; homes are located about one kilometer from farm fields. The main source of income for Coptil was from the sale of water from a large artificial reservoir owned by the cooperative to commercial rice farms on the lower plateau (Rockett, 2003). Coptil's farmer cooperative was involved mainly in retail sales of goods and farm supplies at two stores, one in the nearby town of Hulha Negra and another small local supply store at the settlement. Both stores carried locally processed goods such as fruit jams and a limited range of farm supplies. Surprisingly, no supply of Bionatur seeds was available for sale at Coptil's local store. In sum, economic conditions in study area settlements appeared characteristic of Brazil's low-income family farm sector.

Local dietary customs and food consumer markets

From interviews and observations, few family farms in the study area maintained home vegetable gardens for food consumption. An extension agent who had observed dietary patterns in household diet among families at Conquista da Fronteira reported that consumption of vegetables in local farm family's diets was low in comparison to the region's urban population (Agent M, 2003).

The local cuisine is heavily based on beef, along with a few staple crops. Rice, beans, potatoes, onions, carrots, and cabbage are the common vegetables in the local diet. Regional varieties of watermelons and squashes are consumed occasionally. I saw little use of leafy greens or salad vegetables in the local diet or for sale.

One retail outlet for "agroecological" produce existed in the study region at the time, far off from the settlements. A small, outdoor street market was open one day a week in an outlying neighborhood of the city of Bagé, 35 km from Conquista da Fronteira. Four to six settlement families traveled to Bagé to supply this retail outlet with high quality agroecological vegetables, cheeses, and fruit jams. I watched as about two dozen shoppers from the local neighborhood purchase the entire stock of goods within two hours, demonstrating potential for agroecological goods in Bagé.

Even so, it was evident that many farm families in the settlements were unfamiliar with organic produce and green vegetables. As reported by Bionatur staff, lack of farmer training and unfamiliarity with agroecological methods was a main constraint to expansion of Bionatur Agroecological Seeds in the settlements.

This brings into question whether the local farmers were well prepared to take on agroecological seed production for Bionatur. Such methods would include limited or no use of agrichemical fertilizers and pesticides, use of natural composts and green manures,

intercropping, natural or biological pest controls, low-tillage methods and more. To what extent were local farmers familiar with such methods? Interviews and observations revealed that few local farmers had any experience in agroecological or organic farming practices. Discussions revealed that the extension agents themselves were not fully trained in organic seed production. Although Bionatur's stated mission was to produce regionally-adapted green vegetable seeds by agroecological or organic methods, adequate extension training in such techniques was not available locally.

I submit that it may have been premature to establish a seed project to produce green vegetable seed lines by agroecological methods at settlements where farmers were mostly unfamiliar with such types of goods, and where few families appeared to consumed green vegetables in the daily diet. I believe this contradictory situation was at the root of problems the Bionatur project was experiencing at the time. Additional prior study of farming practices, affinity for seed saving, and dietary customs in the settlements appeared necessary for success of this project for green vegetable seed production.

For example, the nearby Coptil settlement had few functional ties to Bionatur Seeds or the Cooperal cooperative. At the time, farmers at Coptil did not produce seeds for Bionatur. Coptil's supply store carried vegetable seed supplies from regional agribusiness companies Top-Seed and Isla; no seed from Bionatur was sold there. At the small settlement of Jaguarão near Candiota one farm out of 15 produced seed for Bionatur in 2002 (Rockett, 2003; Farmer J, 2003). I submit that after six years in operation, neither Bionatur's strategy for vegetable seed production, nor the project's introduction of agroecological farming practices had gained broader acceptance and adoption among local settlement farmers.

Commercial seed production by Cooperal and the founding of Bionatur

A look at prior seed production activities in the study area helps illustrate why Bionatur was established. The Cooperal Regional Production Cooperative was founded in July of 1992 at Conquista da Fronteira by recently-settled M.S.T. farmers. It was spearheaded by M.S.T. national-level strategy to organize farm production and services around regional cooperatives. The cooperative began with 450 farmers; by 2003 it had doubled membership to 900 member-families (Manager P, 2003; Harnecker, 2002).

At its founding, Cooperal's goals were to connect local farmers in a regional centralized cooperative, to more easily acquire financial credit, to organize dairy production and distribution, to expand technical extension and training and to build harvest storage facilities. Seed production was not initially envisioned by Cooperal's coordinators.

In 1993 three mid-sized commercial seed companies, Top Seed, Feltrin, and Isla[12], approached Cooperal to recruit farmers to produce conventional hybrid vegetable seeds. For about two years up to 250 Cooperal-affiliated farmers produced seed for those companies, each under individual contract. However, after two years the seed companies began to cancel most contracts; by 1995 less than 50 Cooperal farmers produced seed for them (Cooperal, 2002; Rockett, 2003).

Why those contracts were cancelled is relevant. A Cooperal document states that farmers were unsatisfied with contract arrangements that provided low earnings, required production of hybrid seed using agrochemical inputs, and allowed seed companies to

[12] Isla accounted for 60% of regional seed production at the time (Cooperal, 2002).

exclude farmers at will. In response, Cooperal farmers began to discuss establishing their own cooperative-owned seed company (Cooperal, 2002).

In 1997 Cooperal founded Bionatur Agroecological Seeds. Initially, Bionatur produced seed lines for a few staple seed crops, mainly favored regional bean, onion and carrot varieties. The region is important in Brazil's carrot seed production due to the ideal temperate climate. Two storage warehouses were built at Conquista da Fronteira, and second-hand seed processing machinery was acquired. By 2003 Cooperal was coordinated farm production in local settlements, including dairy, and its affiliate Bionatur Seeds coordinated vegetable seed production and sales (Rockett, 2003; Manager P, 2003).

In the following section I present in more detail the work and trajectory of Bionatur Agroecological Seeds, the main case study, with review of outcomes through 2003.

Case Study: Bionatur Agroecological Seeds

Bionatur's founding and early trajectory

Bionatur Agroecological Seeds began in 1997 as a seed reproduction project of the Cooperal Cooperative. Bionatur was founded by Cooperal with advisory support from M.S.T. agronomist Ciro Correa and João Rockett, a local independent organic

farmer and seed saver. Bionatur began its work in 1997 with 12 selected farmers who were contracted to produce seed of regional varieties of bean, carrot and onion.

Mr. Rockett was Bionatur's first operations coordinator. He is an experienced organic farmer and expert in seed saving and permaculture who began to farm near Bagé during the countercultural "back to the land" movement in the late 1970s that attracted many young Brazilians to intentional rural communities. Rockett has saved and reproduced native varieties of bean and maize seed since the early 1980s. He is not an M.S.T.-affiliated farmer, but rather an allied supporter of the movement. Currently, Rockett coordinates the Pampas Permaculture Research Center at his small farm on the outskirts of Bagé (Rockett, 2003).

In February 2003, Rockett provided me a firsthand account of Bionatur's early history. During the early 1990s, he often visited the Conquista da Fronteira settlement, where he knew many Cooperal farmers. He knew that some saved seeds, but that almost no one there used organic methods. As Cooperal's seed producers lost contracts with private seed companies, he recognized a need for alternative sources of seed. In early 1995 Mr. Rockett met with agronomist Ciro Correa who encouraged him to develop a plan for organic seed production at local settlements. Rockett drafted a plan and presented it at a meeting of 25 regional Cooperal cooperative members in late 1996. They agreed to establish Bionatur as a cooperative-owned agroecological seed reproduction project, owned by Cooperal and provided with support by state-level M.S.T. coordination and extension branches.

In early 1997 Rockett interviewed a number of farmers and contracted with twelve to produce seed for Bionatur. He was hired as Bionatur's operations coordinator

and held the position until 1999 (Rockett, 2003; Cooperal, 2002).

Bionatur seed production in its first two years involved staple varieties of carrot, maize, onion, and bean seed. Rockett reported very good results for the first two years: rainfall amounts were ideal, and germination rates and yields were high. He reported that seed stocks were full at the time[13]. As more farmers became involved in producing seed for Bionatur, Cooperal invested in machinery and packaging materials and built two warehouses for seed processing and storage.

In 1999 the Cooperal cooperative acquired second-hand seed processing machinery, including two gravity tables to clean seeds. With funding from state agencies, the firm developed capacity for seed processing, storage, packaging, and sales. Grants and credit lines were obtained from two state-government farm development projects, Lumiar and PROCERA (Rockett, 2003).

In its first two years Bionatur's seed lots expanded and farmer participation increased somewhat, but differences in strategic approach began to emerge. Cooperal managers sought to expand the number of participating farmers, and diversify seed lines for market sales. However, Bionatur was a new, very small startup company with an unusual product line of "agroecological" vegetable seeds. It had a minimal staff, few participating farmers, and thus little capacity to successfully enter the regional vegetable seed market. Technical extension and training in organic or agroecological methods for Bionatur seed producers were limited.

Mr. Rockett wished to work closely with a few well-trained farmers to establish a seed conservation bank to collect and conserve native crop varieties, as well as to carry out field trials and expand technical training for farmers. However, this did not occur.

[13] Published seed harvest yields and sales figures were not available for 1997 to 1999.

After two years as manager, Rockett felt overextended as operations manager, fundraiser and liaison; this led to his departure from Bionatur in 1999 (Rockett, 2003).

Later, M.S.T. agronomist and farmer Manager P was hired Bionatur's coordinator. In 2002 the M.S.T.-affiliated farm extension agency COPITEC began to work with local farmers, including seed producers (Rockett, 2003; Cooperal 2002).

From 1999 to 2002 Bionatur's farmers produced a total of 15 metric tons of staple crop seeds. Later, the company largely abandoned staple seed production and reoriented seed lines toward green vegetables, including regional varieties of squash, onion, carrot, melon, beans, greens and cabbage, all grown organically and destined for sale to small farmers and home gardeners in southern Brazil (see Table 3C).

Bionatur's processing and storage facilities were located at the Cooperal Cooperative at Conquista da Fronteira inside two large, high-ceilinged brick warehouses, each about 1,600 m^2. The main warehouse contained a seed thresher and two gravity tables used to clean small-sized seeds such as of carrot. I observed that the machinery appeared quite worn, but functional. The larger gravity machine was seen in operation cleaning several bags of carrot seed. At the time the limited remaining stock of Bionatur seed was stored at a warehouse at the time; this consisted of about a dozen 15-kilo sacks of carrot seed, and perhaps 200 to 300 kilos of onion seed bulbs.

In promotional material Bionatur is described as, "the first agroecological seed company in Latin America". In 2003, Bionatur seed products included about 40 open-pollinated horticultural seed varieties, all produced using agroecological methods, i.e., without use of chemical fertilizers, herbicide or pesticides. To clarify terms, although occasional references to "organic seed" are made in company documents, as of 2003

Bionatur's seed products were not legally certified or labeled organic. Bionatur seed lots go through the Rio Grande do Sul Department of Agriculture testing for quality control and certification for germination rates, but are not certified as organic (Bionatur 2003).

In 2003 the cost of all single Bionatur vegetable seed packets at retail level was uniform for all varieties at R$1, or about US$ 0.30 (Manager P, 2003). No information was provided by Bionatur on project revenues from seed sales.

Bionatur Seeds promoted an agroecological approach to producing vegetable seed. This required training and credit assistance for farmers to transition to organic or low-input production methods, including chemical-free fertilization and use of biological pest and disease controls. Proponents of this approach included Mr. Rockett, Mr. Correa, and agronomist Dr. Sebastião Pinheiro, a former agricultural chemist from the University of Rio Grande do Sul who has written extensively on the health risks of agrichemicals in Brazil's agriculture. He joined Rockett as an outside consultant in the project's initial stages. The difficulties of such a transition soon became evident (Pinheiro, 2001; Rockett, 2003).

Bionatur: seed production data, 1997 to 2001

Data on seed yields were made available by Bionatur for three years: 1999, 2000, and 2001. Seed yields for 24 vegetable varieties produced by Bionatur during those years are shown in Table 3C. Data on seed yields for 2002 and 2003 were not provided, which may be due to substantial drop in yields in those years. No information on Bionatur annual seed sales and revenues was provided, which are assumed to have been low for

2002 and 2003, from information gathered. Farmers' earnings from seed production are estimated later in this chapter.

From all evidence, Bionatur had entered a niche in Brazil's horticultural seed market but evidently lacked the production and marketing capacity to compete in commercial regional seed markets.

Table 3B: Bionatur seed harvest yields, 1999 to 2001, by volume (kg.)
(source: Bionatur, 2003)*

Seed Variety	**1999**	**2000**	**2001**
Carrot, Brasilia	3,000	2,000	500
Cilantro	2,000	n/a	1,000
Onion, Crioula	300	270	n/a
Onion, Norte	150	200	n/a
Onion,Baia Periforme	415	50	n/a
Onion, Primavera	n/a	n/a	600
Onion, Madrugada	n/a	n/a	800
Squash, Menina	91	81	200
Squash, Sul Mineiro	80	n/a	200
Squash, Tronco	n/a	26	100
Squash, Caserta	150	79	100
Watermelon, Crimson	150	25	100
Melon, Carvalho	80	48	100
Melon, Gaucho	75	70	120
Okra, Santa Cruz	300	n/a	400
Strawberry, Coroa	130	n/a	150
Mustard, Lisa	100	n/a	80
Pea	85	26	100
Mustard, Crespa	n/a	106	25
Watermelon, Congo	n/a	10	40
Watermelon, Charleston	n/a	23	50
Cucumber, Caipira	n/a	88	25
Arrugula	n/a	62	20
Radish	n/a	12	10
Total seed production	**7,106 kg.**	**3,176 kg.**	**4,720 kg.**

*(n/a: not available)

From 2000 through 2002 Bionatur's seed sales were directed to family farm

associations and home gardeners outside of the region. Eighty percent of Bionatur's seed sales were to small farmers' associations not associated with M.S.T. settlements (Correa, 2003). Bionatur's capacity for market outreach appeared very limited. The lack of a printed catalog or a sales oriented website was surprising for a market based project.

The sharp reduction in seed stocks during the 2001 and 2002 seasons was a serious setback for Bionatur. Seed stocks for most varieties were very limited during that period, with many varieties having been entirely depleted. One exception was carrot seed, which averaged exceptionally high yields but showed little market demand. The supply of onion seed, a higher value crop, was critically low in 1999 and 2000. In sum, sales of Bionatur seed were almost at a standstill in February 2003 according to its coordinators (Correa, 2003; Manager P, 2003). Public distribution of 10,000 Bionatur seed packets I had witnessed a few weeks earlier at the World Social Forum Low may reflect the project's low marketing capacity (see Chapter Two).

The high cost of packaging materials was identified as an ongoing problem for Bionatur. Manager P stated that the cost of Bionatur retail seed packing envelopes represented 30% of total product costs because each packet label included a costly photocopy of the product. A large stock of costly aluminum packaging for wholesale turned out to be excessively large and inadequate (Manager P, 2003).

Farm income from seed production

From 1997 to 2003, small numbers of farmers Conquista da Fronteira and other local settlements were involved in producing vegetable seed for Bionatur. According to

company figures, 56 farms in the region were under contract in 2002, out of a total of approximately 1,200 active family farms. Data on seed yields and earnings per farm were not available. Total number of local farms producing seed under contract to Bionatur from 1997 to 2002 is shown in Table 3D; total field area planted in Bionatur production and average area per farm in seed production are shown in Tables 3E and 3F.

Data in Tables 3D, 3E and 3F show relevant trends between 1997 and 2002. The number of farmers producing seed and total area planted for Bionatur Seeds was relatively small compared to the total number of farms in the settlements (about 1,200). The number of seed producers increased. The total area planted for seed production also increased, but this figure represented only a small parcel of land per farm.

TABLE 3C: Number of local farms producing seed for Bionatur, 1997 to 2002 (Source: Bionatur, 2003)

1997	**12**
1998	**30**
1999	**30**
2000	**36**
2001	**42**
2002	**56**

TABLE 3D: Total area in Bionatur seed production, hectares, 1997-2002
(Source: Bionatur, 2003)

1997	**7**
1998	**11**
1999	**11**
2000	**16**
2001	**48**
2002	**95**

TABLE 3E: Average area planted per farm for Bionatur seed, hectares, 1997-2002
(Source: Bionatur, 2003)

1997	**0.5 to 0.6**
1998	**0.3 to 0.4**
1999	**0.3 to 0.4**
2000	**0.5 to 0.5**
2001	**1.0 to 1.5**
2002	**1.5 to 2.0**

From a document provided by Bionatur the price per kilogram paid to local farmers for different seed varieties was established as follows: two seed crops brought in higher payments: tomato seeds paid R$35 per kilogram, and R$ 30 per kilogram was paid for sweet pepper seed. In a medium range, onion seed paid between R$ 18/kg and R$15/kg. Thirty other varieties, including several brassica and cucurbit varieties, carrot, melons, cucumber, spinach, lettuce, radish parsley, and arrugula seed paid farmers between R$ 10/kg and R$ 5/kg. A few more varieties paid farmers under R$5/kg., including lentils, sunflowers, fava beans, peas, cilantro, and okra[14] (see Appendix C).

It is clear from the figures that a large quantity of seed of any variety would have to be produced per farm to produce cost-effective earnings. The seed produced would have to be sold on a season basis to sustain earnings.

Family farms in the study region are in the lowest income sub-segment of the state's family-farm sector. Figures for average annual net revenue per local farm were not available; extension agents roughly estimated average yearly net earnings per farm at between R$ 2,400 and RS$ 3,600 [15] (Agent M, 2003; Sosa, 2003).

Technical support, financing and project reassessment

[14] Approximate currency exchange rate in 2003: US$ 1= R$ 3.3
[15] US$ 800 to US$ 1,200

In February 2003, Bionatur was administered by a team of five people. Bionatur Manager P is an agronomist trained at the regional farm extension college who settled with his family at the nearby settlement of Coptil before moving to Candiota (Manager P 2003). In early 2003, Manager P ran Bionatur from its main office in Candiota. His tasks included selection of seed varieties, allocation and management of contracts with seed producers, coordination of extension services, and wholesale and retail seed sales. Alongside Manager P, Bionatur's office personnel included a sales representative, a bookkeeper, an office assistant and a receptionist. Sales and marketing activity were at a minimum at that time due to nearly depleted seed stocks and lack of marketing capacity.

Agronomist Ciro Correa of the M.S.T.'s National Production Sector co-founded Bionatur and has provided strategic coordination and outreach throughout the project's trajectory. Mr. Correa is coordinator of seed projects for the M.S.T. at national and international levels. In 2003 Mr. Correa lived in Brasília, but communicated often with Bionatur's on-site coordinators in Rio Grande do Sul. Mr. Correa is a proponent of Bionatur's expansion into a national-scale M.S.T. seed network (Correa, 2003).

In 2003, a small team of extension agents from three extension agencies worked alongside local farmers. About eight extension agents were with COPTEC [16], a regional farm extension organization. The agents (*técnicos*, as they call themselves), were young highly dedicated agronomists of different backgrounds. Each agent took on extension services for a specific production line; some worked with dairy farmers and others with seed, pork, grain, and honey producers. At the time of my research, two COPTEC agents worked exclusively with seed producers (Agent M, 2003).

[16] COPTEC: Field Technicians Cooperative (*Cooperativa de Técnicos de Campo*).

CETAP is another extension team that promotes family farming and sustainable agriculture at several locations around the state. At the time it had two extension agents working with Bionatur. The French rural development organization CICDA provided planning and funding for Bionatur through an extension agent in the region. Each extension agent offered interesting perspectives in interviews and discussions[17].

All Bionatur staff and technicians highlighted an urgent need to improve training resources and basic adult education in the settlements. Bionatur staff qualified the education level of many local farmers as limited, with only a small minority having completed secondary school education.

In.early 2003 Bionatur lacked technical manuals and training materials on seed production and agroecological farming. Farmer training in organic vegetable and seed production, non-chemical fertilization and integrated pest management was minimal (Agent M, 2003; COPTEC, 2003). Manuals on agroecology and alternative agriculture that were recently published in Brazil were not available on site. This shortage of technical resources was surprising.

From the start, Bionatur staff discussed the urgent need for improved technical training. In the face of such impediments COPTEC and CETAP farm extension agents were eager to discuss these problems and find solutions. Their work included initial efforts to elaborate a technical manual for local organic seed producers. Occasional workshops on organic composting and pest control techniques were offered, but not well attended. Agents worked with a few local farmers to improve soil tilth by using cover crops and low-till practices (Agent M; COPTEC, 2003; CICDA, 2003).

[17] CETAP: Center for Popular Alternative technology (*Centro de Tecnologias Alternativas Populares*); CICDA: Centre Internacional de Cooperation pour le Developpement Agricole.

Some staff members supported establishment of a model organic farm, along the lines of M.S.T. farm extension training schools that exist in other parts of Brazil. By 2004 a new adult vocational training school had opened at Conquista da Fronteira. It was not known whether the new school's courses included agroecological farming or seed production methods (Manager P, 2003; Lavender, 2005).

From local reports Bionatur carried out few seed field trials between 1996 and 2003, aside from germination tests. Mr. Rockett called for a participatory research approach based on organized groups of farmers visiting regional model farms and carrying out organic seed production trials, but this remained unfulfilled (Rockett, 2003).

Bionatur received limited financial support from the state-level M.S.T. and from state government development agencies. Initially, the project received start-up grants and additional funds from the PROCERA division of the state Department of Agriculture, but those funding sources had ended by 2002 (Cooperal, 2002). State-level M.S.T. coordination had provided some credit to Bionatur but this funding was reportedly not consistent (Manager P 2003; Agent M, 2003).

From company documents, total investment in Bionatur in its first six years was about US$80,000. Capital improvement expenses included construction of two warehouses and purchase of seed processing machinery and packaging materials. Much of the firm's expenses were payments to farmers for seed produced (Manager P, 2003). For an aspiring commercial enterprise, the low level of capital investment clearly impeded the implementation of key plans.

In January 2003, I met with Bionatur coordinators and representatives of U.S. charitable foundations who attended the World Social Forum and had expressed interest

in extending grants or loans to finance Bionatur. The foundations raised doubts regarding Binatur's lack of a well-defined business plan. They not understand whether it was a commercial enterprise, or a non-profit, or both. Final results of those negotiations are not known, but evidently outside funding was not provided at that time.

Importantly, Bionatur's strategy after 2000 appeared to have been redirected toward entry into the commercial seed market, rather than to improving local farmers' access to seeds. Wholesale and retail seed sales were aimed to associations of family farmers and home gardeners across the state, but not to local settlement farmers. Evidently, this commercial approach was in response to demand for seed from more prosperous family farmers and home gardeners in northern RS and Cooperal's desire for income from market sales.

At the time of my field research, it was evident that Bionatur was experiencing serious setbacks. In 2001 and 2002 a drastic drop in Bionatur's seed yields due to extremely rainy weather conditions; the project suffered. Additional constraints on the project were the high cost of packaging, a low level of capital investment and a lack of technical training (Manager P, 2003; Correa, 2003; Agent M, 2003).

In interviews in January 2003, project coordinators were forthright in admitting that Bionatur was in crisis mode and suffering from depleted seed stocks, low farmer participation, lack of technical training and funding and climatic stress (Manager P, 2003; Correa, 2003). I attended production planning meetings in February 2003 in Candiota during which Bionatur staff allocated seed varieties and acreage per crop to be sowed for the following season's seed production; local farmers were not present at this meeting (see tables 3D and 3E).

Another problem was limited mobility of farmers and extension agents between settlements. Transportation to markets and farms was difficult in rainy season. Bionatur staff and extension agents living Candiota needed to travel about 25 km to Cooperal's facilities and settlement farms. Bionatur staff used two old, dilapidated Volkswagen vehicles and two dirt motorcycles for travel; the vehicles were shared and in poor condition. At the time, a lead COPTEC technician and a visiting journalist were injured in a motorcycle accident on their way to a settlement. The difficulties of travel between farms and settlements seemed an impediment to the project's extension services.

Facing a set of critical problems, in February of 2003 Cooperal Bionatur staff began to carry out field assessment surveys in an effort to reinforce the project. Agents cited an ongoing problem of lack of accurate data on Bionatur's performance, due to Bionatur's limited personnel and low capacity for project monitoring and documentation. In February 2003 Bionatur hired agronomist Vladimir Moreira to carry out a Rapid Participatory Diagnostic survey of Bionatur farmers and field conditions at Conquista da Fronteira and other settlements; this was the first such survey in the area. I obtained an initial version of the survey report in which Mr. Moreira noted the limited interest of farmers in working with Bionatur Seed, as well as the difficult local soil conditions (Agent M, 2003; Moreira, 2003; Sosa, 2003).

Local introduction of organic and agroecological farming

Bionatur seed products are labeled as "agroecological" and are produced without use of synthetic agrichemicals. Farmers utilize non-chemical inputs such as organic compost and green manures to improve soil fertility. Natural phosphate is sometimes

added at rates of 200 to 250 kilograms per hectare[18]. An agroecological mineral additive called MB4 is also utilized; its exact composition was undetermined. Liquid bio-fertilizer is made on some farms from cattle, pork, chicken, turkey, and duck manure. Application of organic bio-fertilizer was observed, in which a farmer used a small, generator-powered backpack sprayer to fertilize a half hectare field of intercropped watermelon/ dryland rice and two hectares of maize and beans with liquid manure extracted from a small duck pond (Farmer J, 2003).

Organic fertilizers and composts are not commonly used by local farmers. Attempts by extension agents to introduce such techniques were taking place in 2003. A worm-bin composting operation was built at the local beef processing plant, where a mix of cow manure and leaf liter was used as the growing medium. Two compost bins there were simple brick enclosures, 15 m long x 1.5 m wide x 0.5 m high, covered with black plastic and hosting a healthy population of earthworms. A small supply of packaged cured compost was in storage, roughly estimated at 30 kg. Whether this fertilizer could be classified as organic is uncertain. This small-scale composting experiment utilized inexpensive, easily available materials and could potentially serve as a model for introducing worm-composting techniques to local farmers. However, the plant manager complained that the compost project had been neglected. He urged that Bionatur maintain the composting operation or it would be closed. Overall, little use of organic composting was observed locally and technicians were frank about its lack of appeal to local farmers, who often found it easier to use agichemicals. Only six local farms had worm-bin composting facilities in 2003 (Manager P, 2003).

[18] Local price of natural phosphate is about R$ 25 per 20 kg. (Extension agent M, 2003).

Non-synthetic pest and disease controls were used by some settlement farmers. These included *calda bordalesa* ("Bordeaux broth") a diluted mix of copper sulfate and lime (calcium carbonate) used as a fungicide and insect repellant applied on some seed crops every two weeks, especially onion fields. A mix of cinnamon and garlic was another natural insect repellant reportedly used by a few farmers (Manager P, 2003

Competing options: vegetable seeds, staple foods, dairy and forage crops

Local farmers' independence and self-direction in making production choices was made evident in an interview that took place with "Farmer J", a 53 year-old with a family of seven, and a veteran of early M.S.T. land occupations. In 2003, he had planted only six out of an available nine arable hectares; the rest of his land was broken by a steep ravine. Farmer J's farm was an interesting example of diversified, small-scale organic farming. He originally had farmed conventionally. In an often emotional testimony, he told me of reaching a financial crisis a few years after settlement, in part due to high costs of farm supplies. He was near to abandoning the farm altogether when he learned about organic methods being introduced locally by Bionatur. Soon he diversified his production lines, adopted intercropping methods and began to fertilize with green manures. Farmer J expressed great pride in his family's self-reliance, good diet and growing prosperity, and he attributed his good fortune to his change of farming methods. However, he said that none of his neighbors had adopted organic farming, which they considered to be untested and risky. Farmer J sold seeds to both Bionatur and to private companies, and retailed produce directly to consumers. His production choices were

based on his assessment of market conditions and his adoption of organic farming. His approach was clearly an exception in his settlement (Farmer J, 2003; Sosa, 2003).

In my observation, I noticed that many fields at Conquista da Fronteira were either sowed in pasture for dairy production or fallow. I also observed large fields, 10 ha or larger, of pastures planted in the preferred forage crop of local dairy farmers, known as *cornichão* (*Lotus corniflora*); this seed crop was not organic, nor was it being sold through Bionatur (Rockett, 2003; CICDA, 2003).

I visited Farmer L, who was busy with weighing and selling a large lot of *cornichão* seed to two wholesale seed buyers. A large rented harvester sat next to his simple wood-frame house. It was reported that Farmer L may have spent a third of his gross earnings from seed on rental of the harvester. Even so, he could earn a profit from the *cornichão* seed harvest, due to the high demand and a good price. Farmer L had produced seed for Bionatur in the past, but at that point was independently selling conventionally-produced forage seed (Rockett, 2003; CICDA, 2003).

From local reports, many farmers at the Conquista da Fronteira settlement had opted for dairy production, which was sold mainly to a large regional dairy processing plant owned by the Italian transnational Parmalat. Farmers' option to produce dairy and/or forage crops likely precluded production of vegetables, staple grains or seeds. This is likely due to higher earnings and lower labor requirements for dairy, as well as to limited land and labor per farm (Rockett, 2003; CICDA, 2003).

Many small farms at Conquista da Fronteira exclusively produced dairy. Data provided for 2002 showed that 210 farms at Conquista da Fronteira and 158 at other nearby settlements were producing dairy (Cooperal, 2002). A Cooperal report from 2002

states that, “dairy production has allowed the permanence and economic viability of farm families and of Cooperal’s markets” (Cooperal, 2002).

Stakeholders in Bionatur expressed divided opinions regarding the local emphasis on dairy production. Both Mr. Rockett and local Farmer A deplored the lack of interest of many farmers in diversifying production for vegetable, seeds and grain crops. As Farmer A complained, “all they do is buy a few cows, put out their milk containers at the side of the road (for collection), and sit back the rest of the day. They have no motivation to produce vegetables, either for their own table or for market (Rockett, 2003; Farmer A, 2003)”. Bionatur and CETAP extension agents also noted a predominance of dairy production and worried about local farmers’ dependency on the transnational Parmalat.

At the time, some farmers in Conquista da Fronteira produced fruit products for local sale, such as canned peach and plum preserves. Others focused on staple grains and small-scale pork production. However, several landholdings at the settlement were idle due to lack of available labor, and some local settlers were apparently finding employment in nearby towns (Manager P, 2003).

In sum, it was clear that in 2003 Bionatur Agricultural Seeds was confronting a difficult set of problems that was putting in doubt its future, either as a native seed conservation project or a vegetable seed company. Following my field study of Bionatur, the next step in my research was to learn what I could about other native seed projects in different regions of Brazil.

* * * *

Chapter Four

The SINTRAF Cooperative’s native maize conservation and

the Agreste region's community seed banks

Native seed conservation projects often envision a distinct set of goals at their outset, and such objectives are often modified and adapted over time to meet changing local needs. Complex factors related to extant environmental and economic conditions and to the socio-cultural setting can influence outcomes and how peasant small farmers might participate in community-based native seed conservation projects.

Following my study of Bionatur Seeds in Rio Grande do Sul, I turned my attention toward two native seed initiatives in two other regions of Brazil. These were a native maize seed conservation project by SINTRAF, a small-farmers cooperative in Anchieta, Santa Catarina state, and a network of peasant community seed banks established in Paraíba state. These two projects appeared somewhat comparable in scale and demographics to Bionatur, but differed in their strategies, history and outcomes. Both projects were closely supported by the Brazilian non-governmental rural development association AS-PTA[19]. I studied those native seed projects as a basis for comparison, in order to better understand seed saving initiatives in peasant communities, and to find effective approaches to their design and implementation.

Native maize seed conservation by the SINTRAF Cooperative in Anchieta, Santa Catarina state

SINTRAF is a regional small farmers' cooperative is affiliated with the

[19] AS-PTA: Assessment and Services for Appropriate Technologies, (translated from the Portuguese).

Movement of Small Farmers[20], located near the town of Anchieta in western region of Santa Catarina state. According to author Adriano Canci, many small farmers in western Santa Catarina region have traditionally practiced crossbreeding of maize and have saved favored lines of regional heirloom or native (*crioulo*) maize[21]. The term "*crioulo*" is a colloquial term widely used in Brazil for diverse types of heirloom seed types, native crop varieties and livestock produced by traditional small farmers (Canci, 2002).

In 1996 a group of members of the SINTRAF cooperative became involved in breeding, saving and selling traditional maize varieties (*Zea mays* L.). The cooperative's farmers made an organized effort to identify and reproduce well-known native maize lines, utilizing as much seed as needed for seasonal harvest, and commercializing the surplus through the Cooperative. At the time, some SINTRAF farmers began to produce *crioulo* maize by organic methods; 170 hectares were produced organically in the region for the 2002 harvest (Canci, 2002: 64).

The conservation of *crioulo* maize seed lines by the SINTRAF cooperative began as a local grassroots effort to rescue the disappearing traditional maize seed lines of the Anchieta region. The initiative was an effort of an association of small farmers to revive and promote traditional crop breeding and seed saving practices maintained by some family farmers. According to Canci, certain rare varieties of *crioulo* maize are produced only at one or two farms in the region (Canci, 2002).

The native maize project began slowly. Long-term discussions began in 1986 between local SINTRAF farmers and agricultural extension organizations about the need to involve local farmers in conserving native maize lines. Following five years of

[20] In Portuguese: *Movimento dos Pequenos Agricultores* (MPA).
[21] In Portuguese: *milho crioulo.*

discussion and planning, the first regional "maize network" was established in 1991 as a temporary regional pilot project to conserve traditional maize varieties, with technical and financial support from the farm extension organization AS-PTA. This first initiative inspired more local farmers to identify and reproduce more varieties of *crioulo* maize within the network, and soon numerous farmers from six regional municipalities joined in the SINTRAF/ AS-PTA native maize network.

In 1992 to 1993, the native maize network carried out comparative field trials of 49 varieties of native *crioulo* maize, as well as some commercial hybrid varieties. Test data collected in the trials showed that yields of *crioulo* maize varieties compared very favorably with commercial hybrid lines. Of the top ten highest yielding maize varieties four were of *crioulo* maize. The second-highest yield of the tested maize varieties was obtained from a *crioulo* line called *"bico de ouro"* (golden beak), which yielded 6,600 kilograms per hectare. Although the initial AS-PTA maize network had a fairly short trajectory over two years, the project generated so much interest and demand among local farmers that in 1997 the SINTRAF cooperative initiated a follow-up program of *crioulo* maize conservation (Canci, 2002).

In its first two years, the SINTRAF maize network planted both commercially improved lines and *crioulo* varieties. This approach was directed toward a specific objective, which was to attract broader farmer participation by balancing economic needs with the rescue of traditional maize. SINTRAF managers saw no contradiction in working with both heirloom and improved maize varieties, under the condition that fields of native maize were well isolated from commercial varieties to avoid cross-pollination. The main goal was to restore the genetic base of the cultivar by conserving heirloom seed

lines and finding compatible new crosses. Seven *crioulo* maize varieties were produced in the 1998 season harvest. By 2002, the number of heirloom maize varieties had increased to 33 lines (Canci, 2002).

The number of SINTRAF farmers who reproduced native maize increased steadily over the network's first six years. By 2001, about half of the family farms in Anchieta municipality, 539 farms of approximately 1,100, produced *crioulo* maize and many without use of agrichemicals. Through this growing effort, SINTAF farmers evidently became self-sufficient in maize seed supplies. According to Canci, 95 % of maize planted in the 2002 season was produced locally in the previous harvest. Between 1996 and 2001, the cooperative planted over 4,000 hectares in maize, which yielded over 100 metric tons of native maize seed for regional sale and distribution (Canci, 2002).

This seed project involved much discussion, field trials, training and outreach to expand farmer participation. From the beginning SINTRAF farmers actively discussed key issues including criteria for selection of *crioulo* maize varieties versus use of improved crosses, isolation of heirloom varieties in the field, introduction of organic farming practices, and the rescue of traditional crop knowledge and culinary traditions.

It is important to note how the choice of varieties was open to discussion. Many local farmers were comfortable using improved commercial maize crosses, which have high yields, shorter plant height and tighter grain than *crioulo* varieties. However, other farmers favored particular characteristics of *crioulo* maize, such as higher grain weight, higher protein content, and a particular flavor, color or appearance. SINTRAF farmers planted both *crioulo* and improved lines, and practiced careful crossbreeding. The purity of *crioulo* maize lines was maintained by a minimum isolation distance of 400 meters

between fields. Under ideal conditions, yields for some *crioulo* maize varieties compared favorably with many commercial varieties. A field trial conducted by SINTRAF in 2001 measured the volume of *crioulo* maize seed harvested per hectare. One one-hectare field trial yielded 4,800 kilograms of maize. From this harvest, after cleaning 1,776 kilograms of viable maize seed were obtained (Canci, 2002: 90).

The effort to recruit and train farmers in the SINTRAF maize network is noteworthy. Between 1997 and 2002 local farmers were offered at least seven courses in seed reproduction and organic practices, and frequent meetings were held to discuss the network's progress. These meetings were reportedly well attended, sometimes by upwards of 200 farmers (Canci, 2002).

It appears evident that the SINTRAF *crioulo* maize project engendered much interest and active participation in native maize across Santa Catarina state and the wider region. In May 2000, SINTRAF co-sponsored the First State Annual Festival of *Crioulo* Maize in Anchieta, with participation of numerous regional farmers associations, several non-governmental organizations and local, state and federal agencies. This event was followed by the First National Festival of *Crioulo* Maize, also at Anchieta, in April 2002.

In sum, over a period of five or six years the SINTRAF native maize project allowed many farmers in western Santa Catarina state to become stewards of native maize biodiversity. Regional seed exchanges became an avenue toward improved access to seed. Some key elements of this project's approach included participative long-term planning by a well supported consortium of small farmers and allied organizations; active interest, support and participation of local farmers; and equal attention to conserving traditional crop varieties and meeting existing economic needs.

Peasant community seed banks in the Agreste region of Paraíba

In the 1990's, an association of peasant farmers and extension organizations in the *Agreste* region of the northeastern state of Paraíba established a network of community seed banks to save and distribute seeds of traditional and regional legumes, maize, and tuber cultivars. As in the SINTRAF maize project, this project was technically supported by the national farm extension organization AS-PTA.

The Paraíba seed banks operated as multiple non-commercial community seed exchanges for local peasant farmers in many communities. In this system farmers could borrow lots of seed to sow from the local seed bank, which were returned in kind to the bank from the following harvest. This approach motivated many peasant small farmers to seasonally reproduce diverse seed lines, portions of which were destined to supply community seed stocks. Specific rules of seed exchange and participation were defined by each local seed bank's membership. In any given year local farmers could choose to participate or not (Almeida and Cordeiro, 1999).

The setting of this project is ecologically and economically different than for the Bionatur and SINTRAF seed initiatives. Located in Brazil's impoverished northeastern region, Paraíba state is narrow and long, extending inland 443 kilometers from the Atlantic coast to its western border; a total area of 56,372 square kilometers. Paraíba is divided into four distinct ecological zones that divide the state along its length. The *Agreste* is a semi-arid ecosystem located between the humid Atlantic Littoral coast to the east and the dry, semi-desert *Borborema* and *Sertão* zones to the west. Precipitation

varies abruptly across the Agreste, creating diverse vegetation types in ecological micro-zones. Average rainfall ranges from 1,000 millimeters per year in the eastern region to 400 millimeters per year just 50 kilometers to the west (Almeida and Cordeiro, 1999).

Of Paraíba state's total population of 3.2 million, 36% lives in rural zones. In the Agreste, population density is very high, as much as 218 inhabitants per square kilometer, and most families live on very small homesteads of less than 10 hectares (Almeida and Cordeiro, 1999).

Two Brazilian researchers, Dr. Paula Almeida and Dr. Angela Cordeiro, studied the peasant community seed banks in Paraíba's Agreste. In their book *Semente da Paixão* (Seed of Passion) they describe the region's peasant farming systems and the establishment of the Agreste community seed banks. In the impoverished Agreste land ownership is highly concentrated. For example, in the 1990s three Agreste municipalities studied by Almeida and Cordeiro, farms of less than 10 hectares comprised nearly 90% of total farm establishments, yet farms larger than 100 hectares occupied 71% of agricultural land. The demographic setting is composed of many very small, low-income subsistence farms, along with small consumer markets located in nearby towns. Thus, the Agreste concentrates a large number of very small family farms of less than 10 hectares, making up to half of total farms in that size category in Paraíba (Almeida and Cordeiro, 1999). The need for affordable seed supplies for low-income peasant farms is evident.

Over hundreds of years, persistent droughts have brought great hardship to the Agreste region's settlers. Difficult soils and ecological conditions in the Agreste have led local farmers to develop seed conservation practices and adapt farming to distinct

microclimates. For many family farmers in this region, seed saving and intercropping techniques are long-held traditional methods. Polycultural farming is one adaptive response to local environmental conditions and nutritional needs. For example, a small field might be intercropped in a combination of food staples such as manioc (cassava), cowpeas, cilantro, and fruit trees. Others fields are planted in maize, beans, and squash (Almeida and Cordeiro, 1999).

The early 1990s brought a resurgence of community seed banks in the Agreste. As a response to local livelihood needs, work was directed specifically to providing farmers with better access to seed supplies. Initial efforts were limited; at the time small farmers' movements in Brazil were struggling against land and market monopolization by regional landed elites (Almeida and Cordeiro, 1999).

A new coalition of local farmer associations and syndicates was formed as a regional project, the Appropriate Technology Network (*Rede PTA*), a regional group of nine organizations working the grassroots to promote agroecological farming practices. Later, organizational and technical assistance was provided by the national AS-PTA[22], which was essential to the success of the Agreste community seed banks. The AS-PTA joined the project in 1993 and began by conducting a participatory agro-ecosystem diagnostic that involved 20 farmer associations and over 60 farmers. Out of this effort a comprehensive seed production strategy was developed. AS-PTA began to mobilize participation among different communities. By 1996, over 25 community seed banks with 9,250 participating family farms had been established across three Northeastern states under this project (Almeida and Cordeiro, 1999: 34; Van der Weid, 2003).

[22] AS-PTA: Assessment and Services for Alternative Agriculture; also previously in the section on the SINTRAF/ Anchieta maize seed project.

An emphasis on enhancing crop diversity and appropriate selection of seed types appear to have been key factors in the growth of the Agreste seed banks. Legumes are a main component of the traditional diet in the Agreste. In 1995, 9.8 metric tons of common bean, cowpea, and lima bean seeds were produced by 530 local families and distributed by 17 community seed banks across the region. By 1999, 25 community seed banks had been established regionally, and 1,500 hectares were planted to produce seed lines of diverse cultivars. Over the course of four years 39 metric tons of legume and maize seeds were supplied to member-farmers by the seed banks. Other traditional cultivars were integrated into the project. 197 families supplied 20 metric tons of yam seed; other farmers began to produce peanut seed. Many towns in the Agreste host weekly municipal farmers' markets where farmers sell and buy a wide range of farm goods including seeds.

Improved conditions for seed storage were an important aspect of the Agreste seed project. A group of local farmers affiliated to the seed banks designed a small zinc silo that could be built at a low cost for seed storage. By 1999, one hundred seventy-five seed silos had been built and distributed to seed bank farms; a combined storage capacity of 35 metric tons (Almeida and Cordeiro, 1999).

As Almeida and Cordeiro point out, seed saving has long been a traditional practice for local farmers; the Agreste project redoubled their efforts. Data from AS-PTA surveys showed that by 1999 the farmer-members of Agreste seed banks obtained an average of 43% of their seed supplies from the seed banks, 33% from their own self-reproduced seed lots, and 24% from commercial purchases. Farmers who were not associated with seed banks averaged 48% of seed stocks from self-reproduced seed and

52% from commercial purchases (Almeida and Cordeiro, 1999: 40). The data indicate that commercial seed purchases may have decreased half for member-farmers. Clearly, access to a diversity of seed types was strengthened by the Agreste community seed banks, and seed storage capabilities and exchange of seeds expanded across the region.

Almeida and Cordeiro see crop biodiversity as, "the principal pillar for the sustainability of family farming", and they have proposed, "construction of a seed security system oriented toward agrobiodiversity conservation (Almeida and Cordeiro, 1999: 49)". The authors consider management of crop diversity by peasant farmers, combined with establishment of community seed banks to be, "an anti-risk strategy, providing flexible options and market advantages (Almeida and Cordeiro, 1999: 23)".

The SINTAF cooperative maize seed project and the Agreste community seed banks are two examples of successful native seed projects carried out by Brazil's peasant farmers. Both projects demonstrate ways in which preservation of traditional agricultural practices and native seed conservation can strengthen economic security in rural communities. These experiences help may inform and reinforce similar efforts in other regions. The outcomes of these two seed projects are analyzed in comparison with results at Bionatur in the final chapter.

The growth of agroecological farming and food markets in southern Brazil

In Brazil's southern states a great deal of organizational activity takes place in and

between family farmers associations. Regional meetings, conferences, campaigns, and public outreach take place constantly. Agroecological farming associations focus on promoting organic foods, value-added farm goods and opening access to new markets. Some associations are more oriented toward farm policy reform and in some cases are aligned with the M.S.T. or with farm labor unions. Native seed conservation initiatives in Brazil often seek to integrate agroecological and organic farming practices.

The ECOVIDA Network (*Rede ECOVIDA*) is a large umbrella network for a decentralized coalition of 150 local family farm associations with 18 offices or "nuclei" across Brazil's three southern states. ECOVIDA provides member-farmers with "participatory agroecological certification" for their products through its "ECOVIDA Ecological Product" label. This network advocates for legalized regulation of organic certification under state and federal law. Farmer-members with ECOVIDA participate in informal organic product monitoring and certification, according to the Network's guidelines. Most members are long-established family farmers; reportedly few M.S.T. farmers were participating in this network in 2003 (ECOVIDA, 2003; Meirelles, 2003).

Many native seed festivals, conferences and workshops on agroecology and seed conservation have taken place over the past decade across southern Brazil. Those events demonstrate the growing public interest in family farming and seed diversity. The National Agroecology Encounter (*Encontro Nacional de Agroecología*- ENA) takes place annually since 2002 in Rio de Janeiro, and hosts thousands of participants from over fifty Brazilian farm syndicates, extension organizations and government agencies. According to conference organizers, the conference promotes, "agroecology as an alternative model for the rural space, in opposition to the dominant agrochemical

model...as an instrument for making family agriculture viable (ENA, 2002)." The First Brazilian Congress on Agroecology took place in Porto Alegre in November 2003, co-sponsored by Rio Grande do Sul's state farm extension agency EMATER and the Federal agricultural agency EMBRAPA.

Brazil's renaissance of agroecology and family farming has occurred due partly to changes in consumer choice. Although diet preferences and food consumer trends are difficult to track, there is growing awareness among many Brazilians about potential health benefits of organic foods and possible health risks of agrichemical contamination in the food system. Middle and upper-class urban Brazilians typically consume a wide variety of both cooked and raw vegetables in the daily diet. Many vegetarian and "health food" restaurants are found in larger cities. Outdoor farmers' markets are popular with food shoppers in larger cities who look for healthful produce. Such consumers often buy organic produce directly from family farmers. Farmers' markets exist in many towns in northern Rio Grande do Sul. For example, every weekend the *Feira Colmeia* in the state capital of Porto Alegre, a large, popular outdoor farmers' market, hosts over 100 family farm produce stands. Other farmers' markets exist in smaller cities in northern Rio Grande do Sul, such as in Passo Fundo.

Such projects and trends are hopeful signs for a resurgence of family farming and native seed saving in Brazil. A final look at the seed initiatives I studied and my conclusions and recommendations are presented in the final chapter.

Chapter Five

Analysis and conclusions

In my thesis research I studied three projects that work to reproduce and distribute native seed lines established by small-farm communities and allied organizations in Brazil. In this final chapter, I identify and analyze constraints that impacted the work of Bionatur Agroecological Seeds, and I attempt to determine causes and suggest solutions. I provide a comparison of strategies and outcomes of Bionatur with two seed projects described in Chapter Four, the SINTRAF native maize conservation project in Anchieta, Santa Catarina state and the Agreste community seed banks in Paraíba state. I discuss technical aspects, economic conditions and social dynamics extant at each project. I conclude with recommendations for designing and implementing native seed conservation projects in similar settings.

All three native seed projects I studied involved associations of smallholder family farmers working in collaboration with farm extension organizations. The three initiatives had certain similar goals; in essence, to improve access to useful, reproducible seed types, and to conserve seed lots of traditional or native regional crops that are suited to local economic needs and well adapted to regional cultivation conditions.

Clear differences existed in the missions and strategic approaches of the three projects. Economic and social factors led to particular outcomes and modes of farmer participation. The goals of my study were to better understand how specific conditions, social dynamics and environmental factors had shaped each seed project, to examine problems that emerged and to find workable solutions.

Constraint to Bionatur Seeds in 2002-2003

By early 2003 Bionatur Agroecological Seeds experienced problems operating

as an organic vegetable seed supplier in the regional commercial market; the project was not to a significant extent supplying seeds to local farmers. At the time, Bionatur management had identified a set of specific constraints and had initiated project assessment. Our interviews and discussions helped shed light on the situation.

In 2003, Bionatur showed little capacity to compete in the regional vegetable seed market as a small, relatively new and for-profit seed distributor. Financial difficulties impeded operations, including low cash flow, lack of investment capital, limited capacity for marketing, high costs for packaging materials and competition from large regional commercial seed companies. In addition, Bionatur had nearly exhausted its seed supplies.

The projects financial condition was worrying. According to company documents, US$80,000 had been invested in Bionatur over six years, a small sum for a market enterprise (Bionatur, 2002). The project's financial assets were minimal in early 2003 and coordinators were seeking funding from international donors. In previous years Bionatur had received limited credit from M.S.T. state-level coordination and state extension agencies, but over time funding was reduced or re-directed toward dairy and other production activities (Correa, 2003; Agent M, 2003).

Bionatur's marketing capacity remained limited at the time. As a commercial seed distributor, it lacked a printed catalog or a website adequate for conducting sales. No product marketing and advertising was evident at the time. There was no clearly defined business plan that could potentially attract investment and credit lines. Clearly, the lack of personnel and financial resources impeded Bionatur from gaining a foothold in the regional seed market. This begs the question of why in 2000 Bionatur turned

toward a strategy of marketing vegetable seed on a regional scale, as opposed to the earlier goal of producing staple crop seeds for local distribution. This shift in strategy is likely at the source of Bionatur's problems.

The factor of farmer participation is important. In the field, I found that only a small group of farmers in the case study area produced seed for Bionatur in its base region. Bionatur seed had not caught on as a preferred production option among local farmers after six years of operations. Impediments included low annual earnings per farm, limited labor availability, delayed payment for harvested seed, and a lack of familiarity and technical training in agroecological or organic farming techniques

Delayed payment for harvested seed posed untenable risk for local farmers. The commercialization cycle for some seed lines, for example carrots, was up to two years. Bionatur was not able to provide payment in advance to farmers to help meet future costs of seed production (Correa, 2003; Bionatur, 2002). Also, the option of more profitable, less labor-intensive production, including dairy and forage crops, was available to local farmers (Manager P, 2003; Agent M, 2003).

In terms of farmer participation, in 2001 less than fifty local farms produced seed for the project, out of approximately 1,200 farms in area settlements. Limited area was planted by Bionatur, per seed variety and per farm. In a 2001 listing Bionatur seed lines listed consisted of 21 varieties of organic vegetables. Total area planted that year for Bionatur seed was 48 hectares, and the average area planted per seed variety was between 0.5 ha and two hectares. Seed production for Bionatur took place at 42 settlement farms in 2003, averaging 1.14 hectares planted in seed crops per farm (area planted in seed per farm was not evenly allocated). Thus, with average local farm size at 23 hectares,

vegetable seed production would utilize a small parcel of each participating farm (Bionatur, 2002; see tables 3C and 3D).

Examining the above figures, it appears land availability was not an impediment to producing seed. What seems evident is that the total volume of seed produced was very small. For most farmers income from vegetable seed production probably did not justify the cost of labor and supplies.

I suggest that the limited total area sowed locally in seed reflected both limited farmer participation and lack of market demand for Bionatur products. Low farmer participation reflected economic insecurity regarding unfamiliar production lines. Such constraints made it difficult for Bionatur to maintain seed stocks and gain entry into the regional seed market.

Data for income earned by Bionatur seed producers under is also significant. From a 2002 company document, a total of R$26,000 [23] was paid to 42 local farmers for producing Bionatur's 21 listed seed varieties. On average, gross income per individual farmer for seed might have earned each about R$620. However, costs of production would take 25% of gross income, and estimated net earnings per farm for seed might have averaged close to R$ 465 per year [24] (Cooperal, 2002; see Table 3C in Chapter Three).

For local farms with an estimated average annual net income of R$ 1,200 to R$ 3,000 [25], earnings from seed produced for Bionatur appeared low to justify production

[23] Value of the Brazilian Real (R) in early 2003: R$ 2.8 equaled approximately US$ 1.
[24] This is a rough estimate; figures for seed production earnings per farm were not made available.
[25] Average local income at Conquista da Fronteira settlements was roughly estimated by a project extension agent (Agent M, 2003)

and labor costs [26] (Agent M, 2003). If seed production provided one third to one fifth of average annual income per farm, one to two thirds of additional income would needed from other production activities in order to earn an average income. For farmers with limited available labor, producing seed for Bionatur could provide only part of the necessary earnings to sustain a livelihood on the land.

Importantly, Bionatur produced seed of green vegetable varieties that were neither in widespread use by food consumers at area farms or for sale at community food markets. Thus, Bionatur staff interviewed expressed pessimism about the project's potential to expand farmer participation in vegetable seed production.

Comparative assessment of seed conservation strategies

Comparative analysis of Bionatur's results with two seed cooperatives described in Chapter Four is useful in identifying solutions. From the literature, the SINTRAF maize seed conservation cooperative in Anchieta, Santa Catarina was designed and established by a regional movement of smallholder family farmers. As of 1986, a strategic framework for native maize conservation had been developed by a growing coalition of local farmers and allied organizations. Field experiments with native maize and technical courses in seed production took place locally from 1991 to 1993 with assistance from AS-PTA, CETAP and other NGOs. By 1996, an extensive network of

[26] Information on total project earnings and average revenue from seed per farm was not made available.

interested farmers was established, and along with a set of accepted criteria for selecting and reproducing *crioulo* maize varieties.

It is clear that a solid cultural and social basis for native maize conservation had long existed in the Anchieta region. Some farms had been established for over a century. Families in the region had traditionally reproduced *crioulo* maize varieties. Some local farmers had years of experience in organic farming, and extension agents had over twenty years of experience with native seed conservation. Planning and discussion of conserving native seed lines had taken place in the community for almost ten years before the project initiated. Well-attended regional and national Maize Festivals took place in Anchieta, further strengthening the region's cultural pride in the value of native seed conservation (Canci, 2002). Unfortunately, none of those advantages characterized the conditions at Bionatur.

Economic advantages for seed conservation were also evident for SINTRAF's well-established farmers. Small-farm production in the Anchieta region is quite diversified, including native or heirloom varieties of maize, beans, soybeans, and tomatoes. For example, over fifty regional or *crioulo* varieties of beans are cultivated locally. It is evident that more favorable economic conditions for seed production existed from the outset at farms in Anchieta, unlike those at the Conquista da Fronteira settlements. The fact that over 500 local farms were producing *crioulo* maize seed within three years of establishing the SINTRAF maize project is evidence of this (Canci, 2002).

In comparison, farmers in the Conquista settlements were relative newcomers to the area in 1997; most had minimal financial assets, and limited production capability and

access to markets. Thus, seed production for Bionatur could scarcely provide local farmers with adequate earnings to justify labor and land use.

In the Agreste regions of Paraíba, the establishment of a network of community seed banks represented a well-planned expansion of traditional seed saving practices of local farmers. Seed reproduction and barter were long practiced in the Agreste (Almeida and Cordeiro, 1999). Peasant farmers in the Agreste are accustomed to practicing informal plant breeding and crop adaptation in the region's demanding micro-ecological zones. Long droughts in Brazil's Northeast and difficult soil and climate conditions have contributed to a cultural logic of farming that highly values seed saving. Crop polyculture and intercropping techniques have been traditional practices of the region's small farmers, thus native crop diversity and plant knowledge is highly valued in local communities. For example, Almeida and Cordeiro point out that in one case they observed 67 varieties of bean cultivars planted in six local communities. In the Agreste, the main seed lines chosen for reproduction, beans, cowpeas, and maize; well-established crops in the regional diet (Almeida and Cordeiro, 1999).

I suggest that key factor in the success of Agreste seed banks was their non-profit business structure. The Agreste seed banks were structured for seasonal exchange and barter of seed lots; the mode of exchange was seed, not currency. Additionally, with a large number of farmers' markets across the region, farmers had more access to food consumers (Almeida and Cordeiro, 1999). Such economic factors provided Agreste seed producers with a higher degree of economic security than most farmers in the Conquista da Fronteira settlements.

Seed conservation at the grassroots in developing regions depends on adequate funding and access to technical resources. This takes place where expert allied organizations can work directly with local farmers to initiate project planning and design, and to provide technical extension, experimental research and credit assistance. It appears that such advantages were present at both the Anchieta and Paraíba seed projects; it was clear from my research that clearly the Bionatur seed project was limited in the areas of participative planning, technical assistance and financing.

Comparison of mission and goals

In any development project, a clearly defined mission and a consistent set of goals agreed upon by a critical mass of participants are fundamental factors in achieving a successful outcome; lack of clarity in defining project goals can generate serious problems. It is important to examine how Bionatur Seeds' mission and goals were defined. I examined changes in Bionatur's mission and compared this to the other projects in order to better understand difficult circumstances that emerged by 2003.

According to project founders, the goals at Bionatur at the outset were to conserve native or regional crop varieties, and to improve local access to staple crops. Founding member and first project manager Mr. João Rockett had focused the project's efforts on conserving staple crop varieties, mainly beans and maize. In 1997 and 1998 Bionatur produced ample stocks of seed of staple crops. Mr. Rockett envisioned three main long-term goals: the sustainable seasonal reproduction of staple seed lines, the establishment of an *in-situ* conservation bank for native seeds, and the introduction of organic farming

to local M.S.T. settlements. Rockett saw Bionatur as an effort to strengthen regional crop diversity and promote seed conservation among local farmers. Entry into the regional commercial seed market was clearly not his priority (Rockett, 2003).

From the start Mr. Rockett and Mr. Correa promoted adoption of organic seed production in the settlements in order to ensure the environmental integrity of local farmland and water resources. From their perspective, Bionatur Seeds was a means of avoiding dependency on non-reproducible commercial seed and diminishing environmental and health risks by avoiding use of commercial agrichemicals (Rockett, 2003; Correa, 2003).

In initial years, a broader goal of extensive regional native seed conservation was still unmet, requiring access to facilities and personnel that were not available, such as a seed conservation bank, field trials and staff experienced in seed saving (Rockett, 2003). Such goals were similar to those implemented at the Anchieta maize project and the Agreste seed banks (see Chapter 4).

Mr. Rockett left Bionatur in 1999. Later, the Cooperal cooperative, owners of Bionatur, evidently opted for an approach toward commercial seed sales and entry into the niche market for organically-produced regional vegetable seed. Thus, a systematic approach toward prior goals of native seed conservation and local food security was much less in evidence.

Unfortunately, Bionatur's move toward entering the commercial seed market coincided with a period of severe climate stress in the region, and setbacks to the project. From 2000 to 2002, extreme rainfall and flooding heavily impacted farming in Brazil's south. Bionatur began to languish due to reduced seed harvests, seed storage problems,

and limited farmer participation; entry into the market was stymied (Rockett, 2003; Manager P, 2003; Correa, 2003).

It is not entirely clear why after 2000 Bionatur opted for a market-oriented approach, rather than a focus on producing seed of staple food crops, such as beans, rice and maize. At the time of my field study, Bionatur Seeds was barely functioning as a for-profit agroecological vegetable seed company, showing little evident capacity to establish a foothold in the regional market.

In January 2003 a group of representatives from the U.S. Ford Foundation and Tides Foundation spoke with Bionatur's managers in Porto Alegre, at a meeting which I attended and where I was language interpreter. The foundation representatives expressed a lack of understanding about the exact nature of Bionatur Seed's mission and goals. They were unsure of its different functions and asked Bionatur to clarify whether it was a for-profit commercial vegetable seed firm, a non-profit native seed conservation project, or both. Prior to any commitment to invest or help fund the project, these potential donors requested a well-defined business plan that could better explain Bionatur's functions. Thus, Bionatur's lack of a well-defined mission and goals appeared to be a fundamental flaw in its structure and a cause of ongoing problems.

One problem was establishment of Bionatur in communities of low-income farmers who apparently had limited affinity and training in organic farming and seed saving. As best I could determine, there did not appear to be a strong tradition of native seed conservation among farmers in the Conquista da Fronteira settlements.

I propose that careful search for and identification of farmers who are expert traditional seed savers and willing and motivated participants is essential in establishing

seed projects at the grassroots. Such conditions appear to have been present at the SINTRAF maize and Anchieta seed bank projects, where the incentive to conserve native seeds originated mainly from local farmers themselves; evidently this was not the case at Bionatur.

As compared to Bionatur, I found clear differences in the mission, goals and trajectories of the two seed projects described in Chapter Four. The SINTRAF Cooperative's maize conservation project was successful in conserving numerous native or heirloom maize varieties, in involving large numbers of farmers, and in promoting native maize seed exchanges across Santa Catarina state. The SINTRAF project benefited from several key advantages. It focused on native maize, a highly-valued staple food crop that is widely consumed and exchanged regionally. A cultural tradition of seed native maize saving had long existed among farmers in the Anchieta region SINTRAF carried out long-term planning and counted on technical expertise and support from the experienced organization AS-PTA (Canci, 2003).

In the case of the Agreste Community seed bank project in Paraíba, the project mission focused on reproducing and exchanging seeds of traditionally valued and consumed staple food crops. This non-commercial approach was based on lending and exchanging seed lots of diverse crops by means of numerous local seed banks. Emphasis was placed on facilitating seed storage, both on individual farms and at community seed banks. The result was a highly participative and well networked system of regional seed banks, supplied by hundreds of farms across the region (Almeida and Cordeiro, 1999).

At both the SINTRAF maize and Agreste see projects, farmer participation grew rapidly. This was in part due to the cultural familiarity of local farmers with the seed

types of staple crops that were exchanged. By contrast, at Bionatur Seeds the vegetable seeds produced were not widely consumed on local farms. Also, the level of technical support was somewhat tenuous considering the difficult goal of producing seeds organically, which was not a requirement of the SINTRAF and Agreste projects.

I submit that the shift in Bionatur's mission after 1999 toward marketing organic vegetable seed lines was not well suited to the needs and conditions of most farms in the Conquista da Fronteira settlements. In that particular social setting, Bionatur would benefit from addressing local farming conditions, and the pressing economic and nutritional needs of recently settled low-income families, rather than a strategy of supplying a niche sector of the regional seed market. Seed conservation projects in peasant farming communities may encounter risks by taking on such an untested market-oriented approach.

This is not to say that Bionatur had failed completely. But it was evident to me in my research, and to most people I interviewed there, that the project had reached stagnation in its activities by 2003; it was evident that new approaches were needed. Considering the large number of M.S.T. farm settlements across Brazil, and the movement's ample intellectual resources and capacity for building networks, Bionatur Seeds would benefit from being re-structured over time as nationwide project that is more focused on seeds to ensure local food security and reduce dependency on commercial seed markets, i.e., an approach more akin to the SINTRAF maize and the Agreste seed bank projects. In fact, at the time of my research Bionatur staff and Mr. Correa were discussing a redesign of the mission and the possibility of expanding nationally; ideas which may have by now been implemented, if at least partially.

Environmental limitations to Bionatur's operations

I suggest that concentration Bionatur's seed production in a relatively small land area created problems, mainly in terms of impact from climate stress and difficult soil conditions. High rainfall and soil saturation in 2002 reduced seed yields and caused spoilage of much of Bionatur's stored seed harvest. The limited area sowed for seed crops and the lack of on-site germination models and experimental plots did not allow for plant breeding gradual crop adaptation to diverse climate conditions. In contrast, Paraíba's Agreste community seed banks were dispersed over a wide geographic area, which provided security from climate extremes.

Harvest security for seed crops could be better achieved by projects that encompass large regions with diverse ecological zones, micro-climates and soil types. This approach involves allocating seed production to an extensive regional network of expert seed savers in widely dispersed communities. It also depends on carrying out surveys to identify farmers with the motivation, economic capability, plant breeding knowledge and seed saving expertise to conserve native seed in order to organize a broad network of seed savers. An emphasis on valued traditional cultivars and attention to local dietary customs are additional advantages. This goes along with hiring well trained extension personnel, providing adequate storage facilities and appropriate technical training, and establishing *in situ* seed storage and conservation banks. Such key elements were present at the SINTRAF maize project and the Agreste community seed banks, but not as evident at Bionatur Seeds.

Organic seed production: introduction of unfamiliar farming practices

Bionatur Seeds' approach toward agroecological techniques represented a logical extension of M.S.T. strategic guidelines for promoting agrichemical-free farming and ensuring better health and environmental conditions. However, by the time of my research little progress had been made toward adoption of organic farming at settlement farms (Correa, 2003; Manager P, 2003). Most local farmers, with a few exceptions, were unfamiliar with organic farming; many utilized agrichemical pesticides and fertilizers. Some non-chemical pest control techniques were used on a limited basis. There were unmet needs for extension training in organic methods, for models of composting and organic fertilization, and for biological and intermediate pest control methods (Agent M, 2003; Farmer J, 2003; CETAP, 2003).

Creating a social culture of organic farming requires years of experimentation, technical education, and mitigation of the risks of transition. Low-income peasant farmers on marginal land, such those at Conquista da Fronteira, will not easily adopt organic farming without having ways of avoiding higher labor requirements and income insecurity during the transition. In regions where agribusiness dominates supply markets, it may be easier for farmers simply to purchase and utilize agrichemicals. Thus, organic farming remains an unfamiliar, riskier "alternative" approach for many of Brazil's peasant farmers, including in some M.S.T. communities.

However, there are some hopeful signs. A demand for organic produce and agroecological goods was reportedly growing in southern Brazil at the time of my research, and my observation of urban farmers markets confirms this. Still, in the

Campanha region there appeared to be a very limited demand for organic produce at the time of my research. Growth over time of a strong regional consumer market for agroecological goods and organic produce will be a key factor for the successful introduction of organic farming. Further study of such processes is important for the benefit of farmers in developing regions.

Organization of labor, dietary customs and economic asymmetry in local communities

The research showed that outcomes for Bionatur Seeds may have been partly determined by the cultural origins and culinary norms of local families, as well as by the prevailing economic conditions.

Most settlers in the study area were relative newcomers to the Campanha region, and families originated from diverse ethnic and social backgrounds. Some were migrants from northern parts of Rio Grande do Sul state; others from Santa Catarina state and elsewhere. Prior to settlement, some families were subsistence farmers on marginal land, others were landless sharecroppers, others were rural wage laborers; a few came from towns and cities. Most farmers at the Conquista settlements had worked individually to move beyond subsistence farming toward producing goods for sale in local markets (Manager P, 2003; Farmer J; Navarro, Moraes, and Menezes, 1997).

I submit that farmers of diverse backgrounds with little prior experience of working in groups are not as likely to pool their labor to work collectively or in networks. In highly networked, collaborative projects, such as the SINTRAF maize and Anchieta seed banks, the farmers clearly benefitted from a taking a more collective approach to

seed saving.

Interviewees at Conquista da Fronteira reported that many local farmers opted to work independently, and identified less with cooperative initiatives and M.S.T. guidelines for forming collectives. For example, many farms contracted directly with private firms for dairy production (Manager P, 2003; Agent M, 2003).

The small farms at Conquista da Fronteira often had only one or two working adults. Farm work was done with minimal farm machinery, and farms were often hard-pressed to maintain a single line of production. Families whose adult children migrated were at a greater disadvantage in terms of available labor. Some families facing serious difficulties had abandoned farming for wage jobs elsewhere. Under such economic conditions, seed production for the local cooperative, with minimal earnings and considerable labor requirements, was not a viable option for many.

Seed projects at the grassroots may benefit from involving farmers who are willing to pool their labor to work collectively. Rather than individual farmers producing seed on small sections of each farm, a large parcel of community land might be allocated and collectively managed for seed production. A collectively organized seed system may allow farmers to share labor and reduce individual economic risk.

M.S.T. national coordination has attempted to promote collective farming initiatives. However, adoption of collective labor has remained low among M.S.T. farmers as a whole, involving less than 15% of M.S.T. farms across Brazil. Geographer Wendy Wolford has written about popular participation in the M.S.T and has identified cultural norms that shape farmers' attitudes toward collective work. She looked at how two different regional populations of M.S.T. farmers perceived collective organization of

labor. She points out that in the northeastern states of Pernambuco and Bahía many peasant farmers have a prior history of plantation or wage labor. Such farmers may have a stronger expectation of earning a weekly wage and doing hierarchically directed tasks, and thus may be less accustomed to investing land and labor to farm collectively, even if it would reduce economic risk. Dr. Wolford sees potential for collectives within M.S.T., but posits that many Brazilian peasant farmers are simply unfamiliar and hesitant to engage in collective farming initiatives (Wolford, 2001).

Farmers in the Conquista case study area were from diverse backgrounds; some were formerly autonomous subsistence farmers; others were farm laborers. It was evident that for many farmers in the area, farm self-reliance and independent production choices were the important priorities, more so than participating in a collective seed initiative (Farmer J; Farmer A; Manager P.).

It appeared from the research that producing vegetable seeds organically on a small section of the farm was neither cost-effective nor efficient use of labor for most local farms in the study area. Bionatur staff reported that many families at local settlements had opted for dairy and/or forage crops because those lines were less labor intensive and generated a steadier income than other activities (Manager P, 2003; Agent M, 2003).

Horticultural crops can improve the nutritional standards of peasant farm families. However, this approach depends on the prevalence of home gardens, as well as on local culinary practices and dietary preferences. The diet of most families in the study area is largely based on beef, rice and beans, with some use of carrots, cucurbits and onions. Mate (*Ilex paraguayensis*) a nutritious tea beverage, is consumed in large quantities but is

not produced locally. With some exceptions, home food gardens were seldom observed or reported at local farms. Thus, the vegetable seed lines produced by Bionatur appeared to be somewhat removed from local community gardening and culinary practices. Enhancing food diversity and improving nutritional standards in peasant farm settlements remains an important area for additional research.

In sum, I suggest that changes in the mission and goals at Bionatur Seeds, along with the introduction of unfamiliar agroecological farming strategies, and limited economic benefits to individual farmers from seed production resulted in a low level of participation in the project. By comparison, the Anchieta maize and Agreste seed bank projects provided clear economic incentive and nutritional benefits to local communities, as self-organized networks that motivated a broad farmer participation.

Development theorists Guha and Martinez-Alier have articulated a theory of ecological distribution problems in low-income rural communities in their work on "environmentalism of the poor". They have outlined how environmental problems and economic conflicts can impact economically marginalize rural populations (Guha and Martinez-Alier, 2000: 31-45). Following their criteria, I suggest that Bionatur's seed producers and farmers in the Campanha region may be at risk from the following factors:

A) Economic inequality and asymmetry: family farmers suffer from low earnings and limited available labor, lack of technical training, and from being restricted to marginal environmental and economic spaces. Better farmland is controlled by agribusiness and wealthy landowners.

B) Resource exhaustion: Genetic erosion of crop diversity: valuable traditional crops and native seed varieties disappear due to neglect and market pressures.

Local soil types are physically problematic; the land base is marginal and eroded.

C) Ecologically unequal trade: commercialized and transgenic seed lines are "dumped" in the market, sold at low prices and brought in by contraband, creating a disincentive for seed reproduction on the farm. Competition from agrichemical-based mechanized farming limits small farmers' entry into local food consumer markets and the commercial seed market.

Such problems existed at the Conquista da Fronteira settlements and may have influenced local farmers choice to opt out of seed production. Regardless of social or political affiliation, every peasant farmer's primary needs are to feed the family, sustain farm production from season to season and earn an adequate income to survive on the land. For peasant farmers in the Campanha, one or two failed seasons can lead to bankruptcy and even abandonment of farming. Under precarious conditions, producing organic vegetable seeds for sale to Bionatur Seeds was a questionable proposition and evidently not a viable option for most farmers at the time of my research.

Conclusions

For its first three years the Bionatur Seeds project focused on reproducing seeds for staple crops; it ample seed good harvests and was able to thrive. I suggest that a change in strategy after 2000 to commercialize a broad line of organically produced vegetable seeds in regional markets may have been premature. The change was not widely adopted by farmers in the local communities. Outcomes were complicated by the

fact that Bionatur was competing for commercial space in a regional seed market dominated by well-capitalized private farmers and large seed companies. This may have discouraged local farmers who faced urgent food security and farm production needs.

The enterprise also appeared to be hindered by the absence of key elements. In my assessment, such constraints included: lack of a well-defined mission and business plan, absence of consistent financial backing and secure credit lines, lack of technical training in seed production, lack of participatory planning alongside farmers, the need for a seed conservation bank and experimental trials, and possibly for a collective approach to seed production.

I summarize here the principal constraints to positive outcomes experienced by Bionatur Agroecological Seeds through 2003:

A) Mission and goals: changes in strategy and management over the first 6 years; uncertainty due to changes and lack of definition of the project's mission.

B) Environmental constraints: low harvest yields and depletion of seed stocks due to difficult soils and climate stress; limited geographic distribution of seed producers.

C) Economic problems: low capital flow and minimal credit; small and often delayed earnings to farmers from seed; limited market access and weak demand for organic seeds in local markets; minimal capacity for marketing and sales; high packaging costs. Also, a trend toward less labor intensive, individualized production options, such as dairy.

D) Technical needs: farmers' unfamiliarity and resistance to adopting organic or agroecological practices; limited technical training resources and personnel; lack of on-site seed experiments, plant breeding trials, or adequate organic farming models; lack of a seed conservation bank.

By comparison, the strategies of the SINTRAF maize seed project and the Agreste seed banks appeared to have more technical resources available and were more in tune with the economic conditions and dietary needs of farmers in those regions.

In response to evident problems, by early 2003 Bionatur project managers were developing plans to restructure and expand Bionatur into a national seed exchange network. The new goal was to identify and involve small groups of experienced seed savers in M.S.T. communities across other regions of Brazil (Correa, 2003).

I hope there is some value in the rather negative assessment of Bionatur Seeds that I present here. As an outsider who is no expert in seed production, my critical perspective of Bionatur may seem presumptuous. However, my conclusions are based on open minded assessment of Bionatur Seeds outcomes following my field studies, extensive discussions with Bionatur's stakeholders, and follow-up analysis.

The research led me to explore ideas about how seed conservation projects in low-income peasant communities might best be designed and organized. My recommendations are outlined in the following section.

Recommendations for native seed conservation projects

I submit that seed conservation initiatives can best succeed in well-selected cultural settings in which seed conservation and plant breeding are traditional, long-established practices. Farmers with experience in plant breeding and seed selection, and deep knowledge of seed saving and crop diversity, along with historical roots on the land, will succeed in carrying out seed conservation projects.

From what I learned, I offer here guidelines for designing and supporting native seed conservation in peasant farm communities:

- Identification of experienced seed savers in geographically diverse communities who are highly motivated toward conserving regional crop biodiversity.
- Extensive long-term participatory planning by farmers & allied organizations, with focus on strengthening traditional farming practices and local economic conditions.
- Availability of consistent funding and credit lines.
- Extensive training of participating farmers by experienced seed savers and plant breeders, along with experimental trials and plant breeding models.
- Appropriate facilities for seed processing, storage and distribution.
- Establishment of on-site regional seed conservation banks, both per farm and in central locations.
- Focus on community nutrition and food security, rather than on market approach.

Additional recommendation include strengthening coordination between involved organizations and state institutions, developing training systems in seed conservation for extension agents and farmers, and in-depth participative surveys to identify local needs and affinity for seed conservation.

Bionatur has continued to function locally in the Campanha region, but reportedly has begun to expand as a national seed network [27] to M.S.T. settlements in the states of Minas Gerais, Paraná, Federal District, and Ceara. Bionatur, as a national seed network, carried out participative diagnostic surveys in several peasant communities in late 2003

[27] Rede Nacional Bionatur de Sementes Agroecologicas

and 2004. Coordinators were hoping to adapt seed production to conditions in each state by involving experienced seed savers, community leaders and technical agents in forming new seed cooperatives (Correa and Monteiro, 2004). These major changes in strategy and scope are timely; hopefully, those expanded efforts will engender positive results.

Agroecological farming will likely become more established in Brazil's peasant communities, where some sectors of the federal and state governments are promoting alternative methods. Alternative farming will necessarily be adapted to local environmental conditions and the economic needs of each community. Ultimately, such a transition will be carried out over the long run by individual farmers and farm cooperatives, and will be influenced by changing food consumer markets.

Family-based small farm systems in Brazil and elsewhere are experiencing rapid changes. As peasant farmers unite in global movements, there are hopeful signs for the economic sustainability of small-scale family farming. Native seed conservation and crop diversity will be key factors toward reaching that ideal.

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